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Charles University

Faculty of Physical Education and Sports
Department of Physiotherapy

ADHESIVE CAPSULITIS

"Frozen Shoulder"

Bachelor Thesis

March 2010, Prague

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Abstract

Objective:

During this thesis I look deeper into all aspects of the diagnosis adhesive capsulitis. I have had two weeks of clinical practice, in association with my theoretical study, where I had one patient with this diagnosis to work with. The aim of both my clinical and theoretical work was to gain more knowledge on the issues regarding adhesive capsulitis, both theoretical and clinical aspects.

Methods:

My clinical work was done at Centrum Léčby Pohybového Aparátu Vysočany, Prague in February 2010. I worked with a female patient born in 1961 with adhesive capsulitis, stage 2. I had 8 sessions with my patient, lasting for approximately 30 minutes each. A typical session included techniques from Post Isometric Relaxation, according Lewit, active and passive movements to the upper limbs, active exercises for improvement of stability, movement patterns and posture and verbal education of the patient.

Results:

Good improvement of hypertonus and painfull triggerpoints were made in neck and shoulder areas. Neck mobility also improved and the patient showed better understanding of posture and her own diagnosis in regard to protective mechanisms and faulty movement patterns.

Small improvements of up to 10 degrees of range of motion were made in shoulder flexion and extension, and pain started to decrease during our last sessions.

Conclusion:

The patient was highly motivated and easy to work with making the therapy and exercise of good effect. Progression was made in the secondary changes and symptoms of my patient, but range of motion improvement was to a small extent, also corresponding to her stage of diagnosis.

Key words:

Shoulder pain, shoulder movement restriction, frozen shoulder, periarthritis, pericarditis, adhesive capsulitis.

Declaration

I declare that my Bachelor Thesis is based entirely on my own individual work, and on my practice at *Centrum Léčby Pohybového Aparátu Vysočany*, Prague, in the time period 08.02.10-19.02.10.

In addition to knowledge gained at CLPA I have studied books, journals and articles regarding this subject to fulfill my thesis. Further knowledge I have gained through my teachers and lecturers during my study at Charles University, Faculty of Physical Education and Sports, Prague.

The list of literature I have used to compose my work is found in my bibliography.

……..

Prague, March 2010

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Firstly I would like to thank my dear Simen for always being understanding, helpful and supportive. For making me smile during stressful times, and for making dinner every night. I would not have survived all the years abroad without you!

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Iselin S. Guldbrandsoy
March 2010, Prague

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1. Preface

In this thesis I have studied the theoretical and clinical aspects of the diagnosis Adhesive Capsulitis of the shoulder joint. I will firstly present the theoretical aspect; etiology, pathology, clinical picture, treatment possibilities, prognosis and classifications. Further I will view the clinical aspects of the diagnosis through my case study, T.K, at CLPA rehabilitation clinic in Prague.

As the diagnosis of adhesive capsulitis is a widely spread, but yet not fully understood diagnosis, there are to some degree disagreements in the literature regarding this topic. I will try to view all opinions and different definitions available, but focus my work on the mostly used and mostly spread theories and opinions on the diagnosis.

2. General part

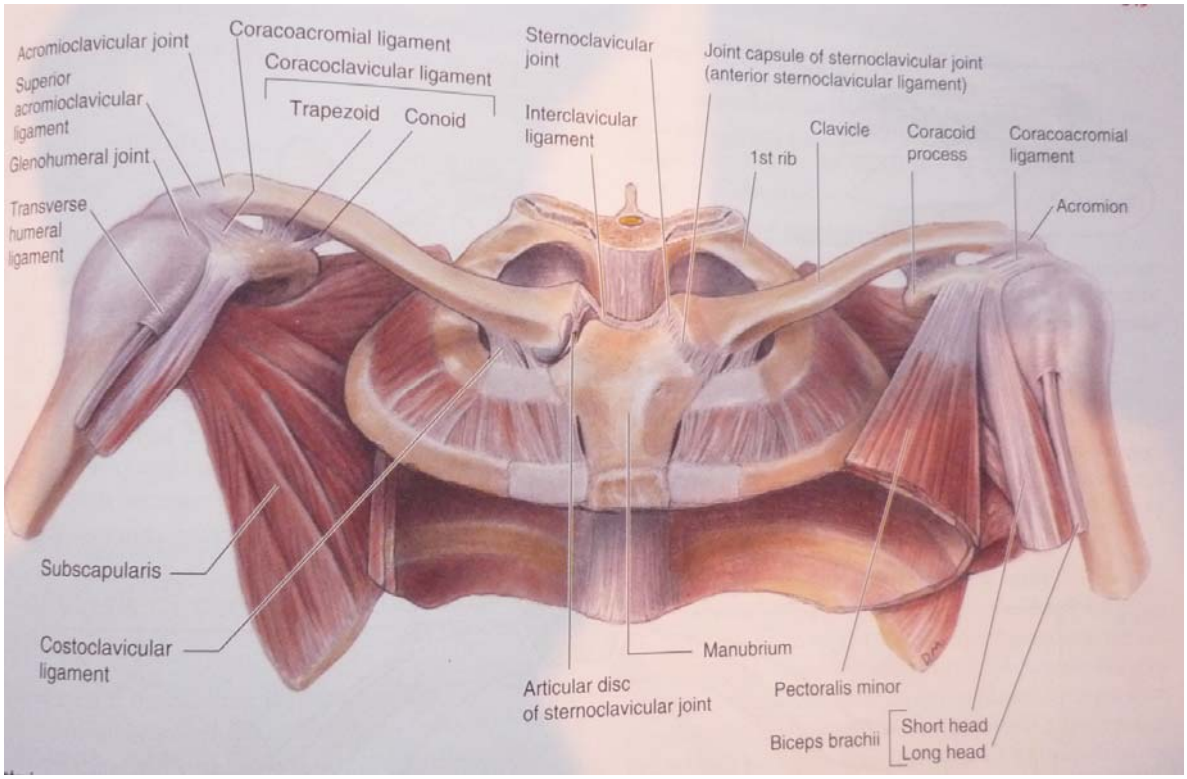
2.1Anatomy of Shoulder Girdle

Firstly I would like to review shortly the anatomical structure that is the shoulder girdle. Later on, in the kinesiology part, I will include movements of all the joints and their muscle components.

Overview:

The shoulder is the region of the upper limb attached to the trunk and neck. The bone framework consists of clavicle, scapula and proximal end of humerus. (1)
All the joints of the shoulder girdle influence each other, and decreased mobility in one of the joints will affect the other joints mobility and also the total reach of the upper limb. (2)

The three joints in the shoulder complex are the sternoclavicular, acromioclavicular and glenohumeral joints. The sternoclavicular and the acromioclavicular joint link the two bones of the pectoral girdle to each other and to the trunk. The combined movements of these two joints enable the scapula to be positioned over a wide range on the thoracic wall, substantially increasing the "reach" by the upper limb. (1)



(pic.1)

Sternoclavicular joint.

This is a saddle type of synovial joint but it functions as a ball and socket joint. The sternoclavicular joint is the only articulation between upper limb and the axial skeleton.

Articulations:

The sternal end of the clavicle articulates with the manubrium and the 1st costal cartilage, and the articular surfaces are divided by an articular disc and covered with fibrocartilage.

Joint capsule:

The sternoclavicular joint capsule surrounds the whole joint, including the epiphysis of the sternal end of clavicle.

Ligaments:

The strength of the joint depends on the ligaments and its articular disc. Anterior and posterior sternoclavicular ligaments reinforce the capsule anteriorly and posteriorly. The interclavicular ligament strengthens the capsule superiorly. It extends from the sternal end of one clavicle to the sternal end of the other clavicle. The costoclavicular ligament anchors the inferior surface of the sternal end of clavicle to the 1st rib and its costal cartilage, limiting elevation of the pectoral girdle. Although the Sternoclavicular joint is extremely strong it is significantly mobile to allow movements of the pectoral girdle and upper limb. (3)

Acromioclavicular joint.

This is a plane type of synovial joint.

Articulation:

The acromial end of clavicle articulates with the acromion of the scapula. The articular surfaces, covered with fibrocartilage, are separated by an incomplete wedge-shaped articular disc.

Joint capsule:

The joint capsule, although relatively weak, is strengthened superiorly by fibers of the Trapezius.

Ligaments:

The Acromioclavicular ligament strengthens the joint superiorly, however, the integrity of the joint is maintained by extrinsic ligaments, distant from the joint itself;coracoclavicular, conoid and trapezoid ligaments. (3)

Glenohumeral joint.

The glenohumeral (shoulder) joint is a ball and socket type of synovial joint that permits a wide range of movement; however, its mobility makes the joint relatively unstable.

Articulation:

The large, round humeral head articulates with the relatively shallow glenoid cavity of the scapula, which is deepened slightly but effectively by the ring-like, fibrocartilagenous glenoid labrum. Both articular surfaces are covered with hyaline cartilage. The glenoid cavity accepts little more than a third of the humeral head, which is held in the cavity by the tonus of the musculotendinous rotator cuff muscles (Supraspinatus, Infraspinatus, Teres minor, Subscapularis)

Joint capsule:

The loose fibrous layer of the joint capsule surrounds the glenohumeral joint and is attached medially to the margin of the glenoid cavity and laterally to the anatomical neck of the humerus. Superiorly, this part of the joint capsule encroaches on the root of the coracoids process so that the fibrous layer of the joint capsule encloses the proximal attachment of the long head of biceps brachii to the supraglenoid tubercle of scapula within the joint. The joint capsule has two apertures; an opening between the tubercles of the humerus for passage of the tendon of the long head of biceps brachii, and an opening situated anteriorly, inferior to the coracoids process that allows communication between the subscapular bursa and the synovial cavity of the joint. The inferior part of the joint capsule, the only part not reinforced by the rotator cuff muscles, is the weakest area. Here the capsule is particularly lax and lies in fold when the arm is adducted; however is becomes taut when the arm is abducted.

Ligaments:

The glenohumeral ligaments, which strengthen the anterior aspects of the capsule, and the coracohumeral ligament, which strengthens the capsule superiorly, are intrinsic ligaments. The coracoacromial arch is an extrinsic, protective structure formed by the smooth inferior aspect of acromion and coracoids process with the coracoacromial ligament spanning between them. This forms a protective arch that overlies the humeral head, preventing its superior displacement from the glenoid cavity.

Muscles:

Muscles that act on the shoulder joint may be divided into axioappendicular muscles, acting indirectly on the joint for ex. on pectoral girdle, scapulohumeral muscles, that act directly on the joint or other shunt muscles acting to prevent dislocations.

Bursae:

Several bursae containing synovial fluid are situated near the joint. They are located where tendons rub against bone, ligament or tendons, or where skin moves over a bony prominence. Including subscapular and subacromial bursae. They are clinically important as they communicate with the joint cavity. (3)

Muscles of shoulder and scapula: (4) (fig.1)

MOVEMENT	SHOULDER MUSCLES	SCAPULA MUSCLES
Full flexion to 180	Flexors: Anterior deltoid Biceps brachii Pectoralis major, upper Coracobrachialis Lateral rotators: Infraspinatus Teres minor Posterior deltoid	Abductors: Serratus anterior Lateral rotators: Trapezius Serratus anterior
Full abduction to 180	Abductors: Deltoid Supraspinatus Biceps brachii, long head Lateral rotators: Infraspinatus Teres minor Posterior deltoid	Adductors: Trapezius, acting to stabilize Lateral rotators: Trapezius Serratus anterior
Full extension to 45	Extensors: Posterior deltoid Teres major Latissimus dorsi Triceps, long head	Adductors, medial rotators and elevators: Rhomboids Levators scapulae Anterior tilt: Pectoralis minor
Full adduction to side against resistance	Adductors: Pectoralis major Teres major Latissimus dorsi Triceps, long head Biceps, short head	Adductors: Rhomboids Trapezius

As seen from this table all the movements of the upper limb are combined movements of shoulder joint and scapula.

2.2 Kinesiology of Shoulder

The upper extremity is connected to the axial organ via the shoulder girdle. In addition to the anatomical joints of the shoulder girdle, sternoclavicular, acromioclavicular and glenohumeral joints, there is also the presence of the false-joints to enable the great variety and variability of movement; scapula-thoracic joint, subdeltoid joint and the joints connecting the ribs to the spine. (2)

Movements in shoulder joint.

Sternoclavicular joint:

During full elevation of the upper limb, the clavicle is raised to approximately 60 degree angle. When elevation is achieved via flexion, it is accompanied by rotation of the clavicle around its longitudinal axis. The joint can also be moved anteriorly and posteriorly over a range of up to 25-30 degrees. (3)

Acromioclavicular joint:

The acromion rotates on the acromial end of clavicle. These movements are associated with motion at the scapulothoracic joint. No muscles connect the articulating bones to move the joint; the axioappendicular muscles that attach to and move the scapula cause the acromion to move on the clavicle. (3)

Glenohumeral joint:

The glenohumeral joint has more freedom of movement than any other joint in the body. This freedom results from the laxity of its joint capsule and the large size of the humeral head compared with the small size of glenoid cavity. The joint allows movement around three axes and permits flexion-extension, abduction-adduction, rotation –medial and lateral of the humerus and circumduction. Lateral rotation of humerus increases the range of abduction. When the arm is abducted without rotation, available articular surface is exhausted and the greater tubercle contacts the coracoacromial arch, preventing further abduction. If the arm is then laterally rotated 180 degrees the tubercles are rotated posteriorly and more articular surface becomes available to continue elevation. Circumduction at the joint is an orderly sequence of flexion, abduction, extension and adduction, or reverse. Unless performed over a small

range, these movements do not occur at the glenohumeral joint in isolation; they are accompanied by movements at the two other joints of the pectoral girdle. (3)

R.O.M in shoulder joint: (4) *(for muscles providing movements, look at fig.1)*

Flexion	180
Extension	45
Abduction/horizontal abduction	180/90
Adduction/horizontal adduction	0/30
External rotation	90
Internal rotation	70

(fig.2)

Scapula:

Scapula is formed as a flat and moveable triangular bone hanging in muscles and articulating with clavicle and humerus. Scapula serves as the supporting base for the upper extremity. (2) With the upper back in good alignment the scapulae lie against the thorax approximately between the levels of the second and seventh ribs. In addition, the medial borders are essentially parallel and approximately 4 inches apart. (4)

The muscles controlling the scapula position and herewith also starting position of the shoulder joint are; m. Trapezius, m. Rhomboidei, m.Serratus anterior, m. Levator scapulae, m. Pectoralis major, m. subclavius. These muscles set the actual position as well as the home position of the shoulder, decisive for the movement of the whole upper extremity. (2) All muscles are obliquely oriented so that their directions of pull can produce rotator as well as linear motions of the bone. As a result, the movements ascribes to the scapula do not occur individually as pure movements. (4)

Movements of the scapula include: (4)

Adduction	Gliding movement in which the scapula moves toward the spine
Abduction	Gliding movement in which the scapula moves away from the spine, and following the contour of the thorax, assumes a posterolateral position in full abduction.
Lateral or upward rotation	Movement about a sagittal axis in which the inferior angle moves laterally and the glenoid cavity moves cranially.
Medial or downward rotation	Movement about a sagittal axis in which the inferior angle moves medially and the glenoid cavity moves caudally.
Anterior tilt	Movement about a coronal axis in which the coracoids process moves in an anterior and caudal direction while the inferior angle moves in a posterior and cranial direction. The coracoids process may be said to be depressed anteriorly. This movement is associated with elevation.
Elevation	Gliding movement in which the scapula moves cranially, as in "shrugging" shoulders.
Depression	A gliding movement in which the scapula moves caudally. This movement is the reverse of both elevation and anterior tilt.

(fig.3)

Comparison the upper limb to the lower limb:

Developing in a similar fashion, the upper and lower limbs share many common features. However, they are sufficiently distinct in structure to enable markedly different functions and abilities. (3)The joint articulations in the shoulder girdle are more moveable and adaptable then the connection of the lower extremity with the pelvis. The pelvis is replaced in the shoulder girdle by the two separate scapulas. (2) Because the upper limb is not usually involved in weight bearing or motility, its stability has been sacrificed to gain mobility. The upper limb has evolved into a mobile organ of manipulation that, along with the brain, allows us not only to respond to the environment but to manipulate and control them to a large degree. (3)

Relationship of the upper limb to other regions:

Neck:

The upper limb is directly related to the neck. Lying on each side of the superior thoracic aperture at the base of the neck is an axillary inlet, which is formed by;

- The lateral margin of rib 1
- The posterior surface of the clavicle
- The superior margin of the scapula
- The medial surface of the coracoids process

The major artery and vein of the upper limb pass between the thorax and the limb by passing over rib 1 and through the axillary inlet. Nerves, predominantly derived from the cervical portion of the spinal cord, also pass through the axillary inlet and the axilla to supply the upper limb. (1) Shortening of neck and shoulder muscles may provoke painful syndroms due to the near relation between neck and shoulder (2)

Back and thoracic wall:

Muscles that attach the bones of the shoulder to the trunk are associated with the back and the thoracic wall and include the trapezius, levator scapulae, rhomboids and latissimus dorsi. The breats on the anterior thoracic wall has a number of significant relationships with the axilla and upper limb. It overlies the pectoralis major, which forms most of the anterior wall of the axilla and attaches the humerus to the chest wall. Often, part of the breast known as the axillary process extends around the lateral margin of pectoralis major into the axilla.

Lymphatic drainage from lateral and superior parts of the breast is predominantly into lymph nodes in the axilla. Several arteries and veins that supply or drain the gland also originate from, or drain into, major axillary vessels. (1)

2.3 Epidemiology of Shoulder Pain

According to the Bureau of Labor Statistics of the United States, shoulder pain is the second most common complaint – after back pain – reported during clinical consultation; furthermore, the prevalence of occupational shoulder pain is increasing greatly. (5)

Disorders of the shoulder are increasingly seen in the work environment, particularly when workers are required to do repetitive overhead lifting or under conditions where static shoulder posture needs to be assumed. As clinicians, one can see that mechanical shoulder problems are not limited in their presentation to the shoulder girdle, but encompass a fairly extensive area of the upper quarter. The most common work related disorders are associated with light industry, assembly line workstations, and office environments. (6)

Persistent shoulder pain is a very common condition that often has a multifactorial underlying pathology and is associated with high societal cost and patient burden. In the year 2000, the direct costs for the treatment of shoulder dysfunction in the United States totaled $7 billion. (7)

Persistent shoulder pain can result from bursitis, tendinitis, rotator cuff tear, adhesive capsulitis, impingement syndrome, avascular necrosis, glenohumeral osteoarthritis, and other causes of degenerative joint disease or from traumatic injury, either in combination or as a separate entity. (6) Rotator cuff disorders, adhesive capsulitis, and glenohumeral osteoarthritis are all common causes of persistent shoulder pain, accounting for about 10%, 6%, and 2% to 5%, respectively, of all shoulder pain. All 3 conditions have complex etiologies, but they can be diagnosed in the majority of patients on the basis of medical history, focused physical examination, and plain film radiographs. (7)

The frequency of specific painful shoulder conditions has been ascertained from several reports. The incidents of common syndromes in 160 unselected cases are as follows:

1. Subacromial bursitis/supraspinatus tendonitis 60%
2. Adhesive Capsulitis 12%
3. Supraspinatus tendon rupture 10%
4. Acromioclavicular joint osteoarthritis 7%
5. Other conditions 7%
6. Bicipital tendonitis 4%

(8)

2.4 Etiology

Frozen shoulder is one of the most common, yet poorly understood disorders of the glenohumeral joint. This is primarily due to the inability of physicians to agree on the exact definition of this syndrome. (11) *I will study the literature and review the most common findings and definitions of this condition. There seems to be a wide variety of opinions to both pathology and treatment opportunities, but I have found some agreements throughout different literature and will study these commonly used theories.*

Adhesive capsulitis is also known as frozen shoulder, periarthritis and pericapsulitis. (12) Adhesive capsulitis is a condition characterized by gradual loss of active and passive shoulder motion. (13) It is an idiopathic (or secondary), progressive, but self-limited restriction. (14)

The etiology of frozen shoulder remains elusive, but our understanding of the pathophysiology has recently improved. (13) It is likely to have multiple causes. (15)

Factors associated with Adhesive Capsulitis include:

1. Female gender.
2. Age greater than 40.
3. Trauma.
4. Diabetes Mellitus.
5. Prolonged immobilization.
6. Thyroid disease.
7. Stroke or myocardial infarction.
8. Presence of autoimmune disease.
   (13)

The prevalence of adhesive capsulitis in the general population is slightly greater than 2%. Approximately 70% of patients with adhesive capsulitis are woman, and 20% to 30% of these affected subsequently develop adhesive capsulitis in the opposite shoulder. (16) An individual's nondominant shoulder is more likely to be involved. (12)

The pathological process related to adhesive capsulitis involves structures intrinsic to glenohumeral joint and surrounding it. The pathologic findings of adhesive capsulitis ultimately depend on its stage of development. The painful phase is characterized by synovitis that progresses to capsular thickening (particularly in the anterior and inferior

positions of the capsule) with an associated reduction of synovial fluid. As the adhesive phase continues, fibrosis of the capsule is more pronounced, and thickening of the rotator cuff tendons is common. As this phase continues, the glenohumeral joint space becomes contracted and often obliterated. Pathological change is more consistent with chronic inflammation with resolution of joint space loss during the final stage. (14)

Although the adhesive capsulitis is primarily due to thickened capsular contractures, there is secondary involvement of other areas, including the following:

- Contracture of the coracohumeral ligament; limiting external rotation.
- Adhesion of subacromial bursa, limiting abduction.
- Progressive fibrous proliferation of the articular capsule and the rotator cuff tendons, particularly the subscapularis and its extensions to the coracohumeral ligament.
- Adhesions between the anterior capsule and the intra-articular subscapular tendon.
  (17)

There continues to be significant disagreement in the literature as to whether the underlying pathological process is an inflammatory condition or a fibrosing condition. There is significant evidence in support of the hypothesis that the underlying pathology is synovial inflammation with subsequent reactive capsular fibrosis. Thus, adhesive capsulitis is both an inflammatory and a fibrosing condition, dependent on the stage at the time. (13)

2.5 Classification

Patients may be divided into:

Idiopathic/primary adhesive capsulitis:

These patients often do not present until they notice significant loss of motion. (18)
This stage occurs in three stages:

1. Acute inflammatory phase similar to acute bursitis or tendinitis. Lasting from 2 to 9 months. (17)
2. Stiffening phase with progressive loss of motion in the capsular pattern lasting from 4 to 12 months. (17)
3. Thawing phase lasting 6 to 9 months with decreasing pain and increasing motion. (17)

The times given for each stage varies to some extent from the different literature. For more on this see the chapter of prognosis.

Even though the dividing into three stages is the more common one, some literary sources also use four stages for this diagnosis:

1. First stage: 0-3 months with pain in passive and active R.O.M
2. Freezing stage: 3-9 months with chronic pain and significant R.O.M limitation.
3. Frozen stage: 9-15 months with minimal pain, except at end of R.O.M
4. Thawing stage: 15-25 months with minimal pain and progressive improvement. (13)

Trauma/immobilized or secondary adhesive capsulitis:

The trauma-based subjects develop significant stiffness after immobilization. (18) This type of adhesive capsulitis is not as common.

This condition follows a traumatic event to the shoulder (i.e fracture, surgery or soft tissue injury) that is usually followed by a period of immobilization. The secondary scar tissue that results is a different nature from the idiopathic form, and the treatment considerations are different as well. There are no well-defined phases in the secondary capsulitis. (19)

In my thesis the focus will be on the idiopathic/primary adhesive capsulitis, and since the three stages are mostly used I will also look at it from this angle.

2.6 Clinical Picture

The classic presentation of primary adhesive capsulitis is that of an otherwise healthy, middle aged woman, who presents with an extremely painful, disabled shoulder. Her clinical history is that of a spontaneous, insidious pain that is often blamed on a trivial traumatic event, such as extending for an overhand shot in tennis or lifting a heavy bag. The pain is lancinating and invokes a reflex guarding, leading to learned response of avoiding all such motions. (19) Physical examination reveals pain at the extremes of motion and markedly reduced active and passive R.O.M of the glenohumeral joint, usually in a capsular pattern. (15)

Symptoms of adhesive capsulitis frequently progress over several months. Early physical findings include lateral and anterior glenohumeral joint tenderness, muscle spasms, usually in the scapular, pectoral and deltoid areas, as well as more diffuse pain. (12) In the later phases the important finding is significant restriction of glenohumeral movement with a compensatory increase in scapulothoracic motion during flexion and abduction. Pain may be present. (20)

Motion loss often correlates with the location of a capsular contracture. Isolated areas of pathology within the capsule will have varying clinical presentations. For example, limited external rotation with the arm in abducted position is usually associated with scarring in the anterior-inferior region of the capsule, as opposed to limited external rotation in the adducted shoulder, which is associated with contracture in the anterior-superior capsular region in the rotator interval. Limited internal rotation in adduction and abduction is associated with scarring in the posterior capsule, which is also reflected in loss of horizontal cross-chest adduction. (11)

The findings noted on physical examination reflect the stage of adhesive capsulitis development. (14)

During the first phase, the painful phase, there is a measurable reduction in both passive and active shoulder R.O.M. Motion is painful, particularly at the extremes of external rotation and abduction. This pattern of motion loss is consistent with a capsular pattern of passive R.O.M. loss, which demonstrates a greater limitation in external rotation and abduction. These signs are similar to those found in osteoarthritis of the glenohumeral joint, in which there is similar loss of motion with shoulder pain. However, this

presentation is in contrast to findings seen in rotator cuff tears, in which active R.O.M is restricted but passive R.O.M may approximate normal values. (14) As the condition becomes established there is development of increasing pain at rest and at night, and a background ache in the shoulder region may be present. (20) A reduced glenohumeral glide is often noted with adhesive capsulitis, especially with inferior translation. (14)

Usually after several months the character of pain alters and becomes less severe. There is a reduction in pain at rest and at night but discomfort and more severe pain in the limits of movement persist. (20) This being the signs for entering the second stage.

In the stiffening phase the most limited motion is almost always external rotation, with the next limited motion being passive glenohumeral abduction. Depending on the amount of stiffening in the second phase, passive external rotation may be the only limited passive motion. As the stiffening progresses, the other parts of the capsular pattern appear. At this stage, if the inflammation still persists, there may be some pain in isometric testing, but the isometric testing is usually generalized, that is, instead of being able to pinpoint a specific tendon or two as in tendinitis, pain may be found on resisted abduction, adduction and internal rotation together. (17) This stage will present with a chronic type of pain associated with movement. The continuum of symptoms progress in this stage to include pain in the upper trapezius and periscapular musculature. Painful spasm of these muscles may extend to the neck additionally altering shoulder mechanisms. (13)

In the chronic stiffening and thawing phase, the pathognomonic finding is Cyriax`s capsular pattern, usually with no pain on isometric testing. (17) The pain is less evident and the dominant symptom is restriction of shoulder movement, which often appears less distressing for the patient now that the pain has eased. There is a slow and gradual improvement in R.O.M, although this is frequently incomplete. The onset and rate of recovery are variable and unpredictable. (20)

Neurologic evaluation is usually normal in adhesive capsulitis, although manual muscle testing may detect weakness secondary to pain. (14)

Injection of an anesthetic agent into the glenohumeral joint may reduce the pain, but it does not result in an improved R.O.M. If adhesive capsulitis is the only problem, a plain radiograph usually is normal and can help rule out arthritis, osteonecrosis, loose bodies

and other local pathology. Additional studies are rarely done. MRI with gadolinium, if done, may reveal thickening of the capsule and synovium. Arthrography, if performed, usually reveals markedly reduced joint capacity, increased filling pressure, intact tendons and an absence of inflammatory arthritic changes. (15)

2.7 Prognosis

The specific time duration for recovery varies in the literature, and as the different stages of the diagnosis may take on different time periods as well the total time is difficult to assume.

One of my literary sources assume it will be approximately 3-8 months for the painful stage, 4-6 months for the second stage, and 1-3 years for the third and last stage. (20)

Some literature, as mentioned under the classification chapter, assume that the acute inflammatory phase is lasting from 2 to 9 months. Stiffening phase lasting from 4 to 12 months, and thawing phase lasting 6 to 9. (17)

Another source states that the total recovery time will be within 2-3 years, and with occasionally present restrictions for 3-4 years. (15)

So, taking all this into consideration the assumed recovery time may vary to a great extent from 1-3 years, also dependent on the treatment given and the state of the diagnosis.

2.8 Therapeutical Approach

During this chapter I will discuss the different aspects of examination and treatment given to the patients with adhesive capsulitis. Examinations and treatment proposals in this chapter are given to the patient when the diagnosis is known, and the differential diagnostics will be discussed in the next chapter.

2.8.1 Physical examination:

A thorough physical examination not only to the affected glenohumeral joint but also to the opposite shoulder, cervical spine and trunk should always be performed to exclude any associated abnormality or pathology. During testing of R.O.M it should become apparent that the primary limitation is in the shoulder joint. Pain may be absent when the shoulder is moved within its free range, depending upon the stage of presentation. Both active and passive motion losses must be recorded and compared because concomitant conditions, such as rotator cuff tear, can result in active motion in a shoulder that is also stiff due to adhesion. The examiner must be careful to identify and control compensatory motions to measure only pure glenohumeral motion. Patients with glenohumeral stiffness often exhibit relatively good motion due to increases scapulothoracic motion or trunk lean.
External rotation, as well as internal rotation is measured with the arm at the side. A firm end point is often expected, with pain at the extremes of motion. (11)
Passive motion should be evaluated with the patient in supine position, restricting excessive scapulothoracic movement and eliminating lumbar and trunk tilt, thereby providing a more accurate assessment of pure glenohumeral motion. (11)

Localized areas of tenderness, especially about the rotator cuff, biceps tendon and acromioclavicular joint should be assessed, in addition to a complete neurological exam. Specific patterns of motion are also noted with regard to the etiology of the stiffness. For example, primary adhesive capsulitis is usually associated with global motion loss, whereas postsurgical or posttraumatic stiffness may present with loss of motion in all planes, or it may be a more discreet limitation of motion affecting some planes while relatively sparing others. Recognizing these different motion-loss patterns are important in determining etiology, as well as planning the nonoperative, and possibly operative, treatment program. (11)

2.8.2 Conservative therapy options:

The treatment goals depend on the stage of adhesive capsulitis, but the general aim is to decrease pain and inflammation while increasing the shoulder range of motion in all planes. (14) The clinician must design a treatment plan that is individualized and based on the severity and chronicity of the patient symptoms, as well as previous therapeutic efforts. As in other medical conditions where the pathophysiology is poorly understood, many different forms of treatment are used empirically in the management of frozen shoulder. Treatment is continuously modified, depending on the individual's response to a particular treatment modality. (11)

Initially, in the first phase, pain and inflammation should be managed by use of ice, anti-inflammatories, and activity modifications. Reducing inflammation and pain through the use of nonsteroidal anti-inflammatory drugs is generally advocated. Injections of corticosteroids (with or without lidocain) into the subacromial space are in many cases useful in breaking pain cycles to allow patients to participate more actively in therapy sessions. (14) The individual is encouraged to use pain as a guide to limit activities of daily living because inflammation and pain can alter shoulder mechanics. The optimal resting position with the arm positioned in comfortable abduction for improved vascularization of the cuff is demonstrated to the patient. Postural training in incorporated to discourage thoracic kyphosis and a forward humeral head position during forward elevation. (13)

Therapeutic modalities are used to:

1. Reduce pain; high voltage galvanic currents, TENS, iontophoresis,cryotherapy
2. Reduce inflammation: iontophoresis, phonophoresis, cryotherapy
3. Promote relaxation: moist heat, ultrasound.

Hydrotherapy can be used to break the cycle of pain and muscle spasm. The buoyancy of the water provides an environment for active-assistive exercises and helps facilitate the return of normal scapulohumeral rhythm. (13)

In addition to the pain relieving modalities, gentle R.O.M exercises can be performed in a few sessions daily. It is vital that aggressive stretching or other active intervention not be attempted during this stage. (18)

An active exercise program should be started as soon as the acute pain subsides. (15)

During the second, freezing stage, the patient exhibits significant loss of motion. Patient has significant pain as they approach their end R.O.M and frequently decrease use of the arm to minimize the pain. Treatment focus should be on maintenance of range while recognizing that a progressive loss of mobility is the rule. Treatment should be gentle extension of the arm within the available range but not making the end range so painful to elicit a significant painful response. Generally, we recommend three to five repetitions of movement exercises done in five or more sessions daily (18). It is important to perform short sessions several times a day, rather than one long session, because the shoulder will become stiff again in between each session. (11)

The patient must know that aggressive end-range exercise is counterproductive. Clinicians may educate the patient to "climb the wall" in the scapular plane as a gentle elevation-oriented R.O.M exercise. An interesting format for this activity is to place a strip of tape on the wall and floor to control and measure movement while minimizing the inherent substitution in this position. (18)

It is important to educate the patient regarding the improvement in R.O.M because the patient will continue to perceive pain at the end of range, and may not recognize the objective improvement in function. In this phase, modalities may also be used as previous to treat pain and inflammation. Joint mobilizations are used to restore joint glide and separation. The goal is to stretch the capsule sufficiently to allow restoration of normal glenohumeral biomechanics. (13) To aggressive mobilizations may actually be associated with less satisfactory outcomes. (15)

Physiotherapy for patients with stage three is designed to treat the significant loss of motion and abnormal scapulohumeral rhythm that is characteristic of this stage. There is dominance of upper trapezius resulting in hiking of the shoulder girdle. This attributed to decrease inferior glide of the glenohumeral joint, which prevents glenohumeral abduction. The primary goal of treatment is to increase the R.O.M. Aggressive stretching will be tolerated and should be the focus of the treatment. Stretching can be taken to the limits of the available R.O.M, and beyond. Cryotherapy may be used to reduce discomfort after stretching. Strengthening of the scapula musculature continues in this phase to reestablish effective force couples. As the R.O.M improves, and if rotator cuff weakness persists, isolation of the cuff can be initiated to address strength

and endurance. The home exercise program includes R.O.M and flexibility exercises and training of the scapular musculature. (13)

A preferred order of movement restoration is critical. Begin with the sequential restoration of abduction, external rotation, and horizontal abduction, and finally progress to the combined movements of extension, adduction and internal rotation – functionally known as reaching behind back. Beginning with abduction and external rotation restores motion with less pain and accomplishes more tangible clinical and functional changes than does horizontal adduction or reaching behind back. Stretching the anterior and posterior aspects of the capsule in the same treatment may nullify the effectiveness of the capsular stretching; therefore, it is recommended to focus on only one aspect of the capsule at a time with both the clinical and the home stretch program. (17)

Reaching behind back is often the most limited motion, which does require adequate capsular ligament length in several areas of the capsule. Therefore, it is the slowest, most difficult motion to be restored. Work abduction and external rotation of the anterior capsule exclusively until R.O.M is restored to the 150-160 degrees flexion and 75 degrees external rotation, then proceed to the posterior capsule stretches. It is important to establish a baseline of the patient's active and passive R.O.M measurements using a goniometer or inclinometer. This information is useful for the continual reassessment process, which gives the clinician feedback and play a role in encouraging the patient. (17)

Modalities such as ultrasound and short-wave diathermy are used to preheat capsular structures for pre-stretching preparation. It is valuable to have the patient stretching while the modalities are applied. (17)

Therapy proposal:

This proposal is made using the knowledge I gained during my studies at FTVS and at my clinical practice at CLPA, through supervisor Mgr. Zaher El Ali. A more detailed description of my case study and the therapy progression can be found in chapter 3.

During the first stage, as mentioned previously pain should be managed. In addition to the modalities used to decrease the pain therapy might include:

- Verbal education of the patient to avoid further worsening of postural adaptations and protective mechanisms of the shoulder areas. Trying to reduce the stress put on the healthy shoulder, and the surrounding tissues by making the patient aware of the situation.
- Relaxation of achieved reflective changes of the skin and soft tissue in neck, torso and arms by use of "shifting of dorsal facia" according Lewit (21) , soft tissue massage to neck and shoulder areas, especially upper trapezius, or massage using small ball.
- P.I.R technique to upper trapezius (21)

During this stage no heat should be applied to achieve relaxation.

During the second stage the pain is decreasing and the ability to work is increasing.

- Continuance of the verbal postural awareness education with increasing emphasis on working positions and home ergonomic.
- Continuance of relaxation of affected skin and soft tissue, using techniques as described during first stage.
- Assisted active movements of shoulder joint in all directions.
- P.I.R technique with an increasing emphasis on the subscapularis (21)
- Relaxation of hypertoned muscles around the shoulder girdle, including middle deltoid, latissimus dorsi, long head of triceps. Either by use of massage or P.I.R.
- Traction of the glenohumeral joint, softly. (21)
- Soft joint mobilizations of acromioclavicular joint, strenoclavicular joint and ribs. (21)

After a while in this stage it can be appropriate to have the patient doing gravity induced P.I.R (21) for the shoulder rotators, especially subscapularis, at home. In addition the assistive active movements may be increased to fully active movements.

During the last stage the pain is no longer present and the R.O.M starts to return.

- Continuance of treatment of skin and soft tissue of reflective changes still are present.
- Removal of postural adaptation and protective mechanisms gained from the painful states. Either by use of exercise, P.I.R, or verbal instructions.
- Strengthening of the shoulder muscles, especially the external rotators.
- Exercises for overall improved postural functions may be appropriate as well, including exercises from Brugger Concept, using Therra-Band (22) or other stability exercises, for example by the use of over-ball.
- PNF technique, with gradually increasing resistance may also be appropriate.

Potential treatment complications:

Treatment complications from conservative management are rare but include side effects associated with nonsteroidal anti-inflammatory drugs and analgesic medications; these include gastrointestinal bleeds, gastritis, toxic hepatitis and renal failure. Cautions should be used in the treatment of patient with congestive heart failure and hypertension due to fluid retention associated with the use on nonsteroidal anti-inflammatory drugs. (14)

2.8.3 Surgical options:

If there has been little or no progress in decreasing the pain or increasing the shoulder mobility, more aggressive treatment, such as manipulation or surgical capsular release, should be considered. (19)

The options at this point include closed manipulation; or arthroscopy, capsular release, and manipulation; or open capsular release. The risks include fractures, neurovascular injury, residual stiffness, instability and infection. (13)

Manipulation under anesthesia.

This method has been used to treat adhesive capsulitis for many years. It has commonly been described to prospective patients as “stretching the tight capsule” or “breaking up

adhesions" within the shoulder joint. Arthroscopic vizualisation of the glenohumeral joint after this procedure, however, reveals that it does not stretch the capsule; instead, it uniformly results in a traumatic rupture of the inferior glenohumeral capsule which extends superiorly into both the anterior and posterior capsule to varying degrees, depending on the severity of the contracture present. Although incidental findings of labral tearing and rotator cuff tearing have been observed, they are not routinely encountered after this procedure. Post manipulation dislocation, fractures of the humerus or glenoid, and neurologic injury to the brachial plexus have also been described. Although these types of complications are serious, and they may result in more complicated course of treatment, their occurrence is uncommon and is reported to be less than 1%. (23)

The results of manipulation under anesthesia for patients with adhesive capsulitis have been reported upon many authors with an average success rate of approximately 70% at 3-6 months of follow up, but with variation in satisfactory outcomes ranging from as little as 30% to as high as 97%. An average recurrent rate of stiffness seems to be approximately 8%. The treatment of patients with adhesive capsulitis and diabetes mellitus traditionally has seemed to be more difficult to most clinicians than treatment of patients who have only adhesive capsulitis. Many remain cautious to utilize this treatment to diabetic groups of patients. (23)

Arthroscopic capsular release.

Because adhesive capsulitis of the shoulder, by definition, is due to only a tight and thickened humeral capsule, arthroscopic surgery seems ideal for the treatment of this problem. The capsule is best viewed, and more directly surgically addressed, by an intra-articular approach rather than an extra-articular, open surgery approach. Arthroscopy allows circumferential capsular release as needed, and post operative pain is often much less due to absence of transmuscular surgical dissection. An important additional benefit is that it can be performed without having to detach and then repair the subscapularis tendon that may be necessary with an open release. This becomes important during post operative rehabilitation, as there is no need to limit the patient's abduction or rotation to protect against rupture of this tendon during early post surgical range of motion. (23)

The risks associated with arthroscopic glenohumeral capsular release include iatrogenic damage to the joint surfaces, excessive soft tissue swelling and axillary nerve damage.

The axillary nerve, due to its close proximity to the extra-articular surface of the inferior glenohumeral capsule, is at risk for injury during this and any surgical procedure involving the inferior capsule region of the shoulder joint. With an open surgery, the nerve can be identified, retracted and protected prior to division of the capsule. During an arthroscopic approach, the axillary nerve most often cannot be seen through the capsule. (23)

Clinical outcomes after arthroscopic capsular release have been gratifying, with published reports documenting 69% to 94% patient satisfaction. (23)

Harryman et al. (24) used this technique on 30 of their most refractory patients with glenohumeral stiffness. The average pre-operative shoulder range of motion was 41% of the uninvolved shoulder. Average postoperative range of motion at day one post surgery was 78% of normal and 93% of normal at final follow up. Pre-operatively only 6% of their patients could sleep on the involved side while post operatively 73% could do so. In the patient group were approximately 47% of their patients diabetic and they observed no difference in any outcomes when these patients were compared to the non-diabetic patients.

Open capsular release.

Open surgical release of the glenohumeral capsule was more commonly utilized to treat patients with severe and refractory adhesive capsulitis prior to the advancement of arthroscopic techniques to treat this difficult patient population. (23)

2.9 Differential Diagnostics of Shoulder Pain.

Firstly, in this chapter, I would like to stress the importance of the capsular pattern when making a diagnosis of shoulder pain and restrictions.

Capsular Pattern of the Shoulder Joint

The capsule of a joint is lined with synovial membrane. In a lesion of either of these structures a limitation of movement of characteristic proportion results. It does not matter if the irritation is synovial only, as in a recent sprain or haemarthrosis, capsular only as in osteoarthritis, or both, as in rheumatoid arthritis; the same pattern results. This varies from joint to joint, but scarcely at all in different patients; in other words, all shoulders, say, are alike, but the pattern of restriction at the shoulder is not the same as the one at the hip. At every joint, the proportion that the limitation of movement in one direction bears to that in other directions conforms to a standard which indicated whether arthritis is present or not. (9)

Cyriax proposed that inflammation of the joint capsule and a resultant limitation of motion followed a predictable pattern of limitation. He called the motion "capsular pattern" and suggested that all synovial joints have a predictable proportional loss of motion when the joint capsule is the primary structure involved. (6)

The capsular pattern of the shoulder is described as a motion pattern in which the external rotation is the most limited motion, followed by glenohumeral (not total shoulder) abduction, and internal rotation as the least limited motion. The examiner will usually asses the patient for a capsular pattern when examining the shoulder using passive R.O.M maneuvers. It is essential that the tests applied are truly passive in nature. If there is muscle guarding or the patient actively assist with the motion, a true assessment of the noncontractile tissues, such as the joint capsule, cannot occur. (6)

The capsular pattern is seen to the same extent in active and passive movements.
A capsular problem that is not severe at the shoulder may only have slight effect on external rotation to begin with, but as the disability develops the other movements will be affected in turn. (10)

Restriction of passive movement in a non-capsular pattern suggest lesion which does not involve the whole capsule, such as ligament injury, a loose body or a lesion which lies outside the joint. It is important to recognize the capsular pattern when it is present so that restrictions in movement are properly interpreted. Without knowledge of the capsular pattern, it would be difficult to make any sense of certain examination findings. Capsular restriction is not a diagnosis in itself, but it narrows the field of investigation. (10)

Making an accurate diagnosis of a shoulder condition requires a consideration of the patient's history, a physical examination, and sometimes imaging studies. (25)

Limb pain may be produced by local structures or it may be referred.
Locally produced limb pain is often:

- Associated with local pathology or dysfunction. In the absence of any associated local lesion or functional disruption, a referred source of pain should always be carefully explored.
- Precisely delineated. Widespread hyperalgesia in nonetheless regularly found in musculoskeletal disorders such as fibromyalgia or diffuse cervicobrachial pain. (26)

Limb pain may arise from local lesions of the bone, joint, periarticular tissues, muscle, nerve or vessel. The nature of the pain experience may also help to identify the tissue involved;

- Bone pain is nagging and worst at night.
- Muscle pain is experienced as tender points over the muscle belly.
- Nerve pain is described as burning, shooting, itching, or pins and needles.
- Vascular pain is severe and throbbing.
  (26)

Intracapsular lesions of the glenohumeral joint, such as from arthritis or capsulitis, typically restrict active and passive range of motion. The more common extracapsular lesions, such as rotator cuff injuries or tendinitis, cause pain on active or resisted motion, whereas passive motion is usually maintained. (27)

When no local lesion can be detected in the limb, the source of the pain must be sought elsewhere. In the case of upper limb pain possible sources are the heart and pleura, diaphragm, and lower cervical or upper thoracic vertebrae. Limb pain may arise in the chest, abdomen or spine. The level of spinal lesion determines if the pain is referred to the upper of lower limb. Referred pain frequently;

- Is aching pain or deep discomfort.
- Has a general, diffuse of patchy distribution. Pain from central nervous system lesions, carcinomatosis, and psychogenic pain cannot be localized. (26)

Shoulder pain referred from the cervical spine, is not affected by shoulder movement but may be influenced by neck movements. The pain may also be felt in the neck and may radiate down the arm to below the elbow. (27)

History/Anamnesis

There are several important aspects of the history that should be established in each patient. (25)

Etiology of the onset of the problem is particularly important, specifically whether it was insidious or if there was a history of trauma. (25)

With trauma there are usually clear indicators of dislocation or separation. Fracture, too, may be implicated by the mechanism, magnitude of forces, and degree of pain.

Common injury patterns for the shoulder include the following: (28)

TRAUMA	POSSIBLE INJURY
Blow to the anterior shoulder	Dislocation, subluxation, or contusion
Fall onto top of shoulder	Acromioclavicular separation, distal clavicular fracture, shoulder pointer.
Fall on an outstretched arm, landing on hand with elbow extended	Acromioclavicular separation, clavicular fracture, posterior dislocation, glenoid labrum or rotator cuff tear
Arm forced into external rotation and horizontal abduction with shoulder flexed to 90 degrees or above	Anterior dislocation, glenoid labrum tear.
Sudden traction to the arm	Medical subluxation or brachial plexus traction injury.
Sudden pain with the weight lifting, no apparent dislocation;	Consider muscle/tendon rupture, labrum tear

(fig.4)

When joints are injured, swelling differentiates them from joints that are in dysfunction. Simple trauma gives rise to synovitis. If the trauma is more sever, blood may account for swelling within the joint. These two conditions can be differentiated clinically. After the blood is aspirated, the synovium continues the production of excess synovial fluid, and this has to be treated in the same way as if there had been no bleeding. The cause of a swollen joint may be pus, and pyarthrosis is one of the medical emergencies that may be encountered in infants and children. Once the pus is removed and the infection controlled by antibiotic treatment, the joint may still be left with synovitis, which requires further attention before the joint can return to its normal functional state. (29)

If the patient had no trauma it is important to find out if he or she had tried any new activities in the days preceding the onset of pain. New activities often initiate a rotator cuff tendinitis but also can aggravate a preexisting arthritis of the shoulder. A history of a "pop" followed by ecchymosis suggests a tendon tear, such as long head of biceps tendon or the pectoralis major tendon. (25)

With frank trauma excluded, the most fruitful approach is first to distinguish the patient`s complaint. Have the patient categorize his or her complaint into mainly pain, stiffness, instability, weakness or numbness and/or tingeling. Ascertain whether there are associated cervical thoracic spine complaints. Although they are rare, determine whether there are any visceral complaints, in particular, right upper quadrant pain suggestive of billiary disease. (28)

The severity of the symptoms at onset is important. If the pain begins insidiously and is not very severe at the onset, then certain diagnoses may be considered over other. A sudden onset of severe pain without trauma could be brachial neuritis, a pinched cervical nerve, shingles, acute calcific tendinitis, a pathological fracture, or acute adhesive capsulitis. Slower onset of pain is typical of rotator cuff tendinitis, idiopathic adhesive capsulitis, cancer, and a multiple of other etiologies. If there is an acute event, the signs of a more serious injury include the inability to continue the activity or sport. Pain that makes a patient nauseous typically reflects a more severe problem. (25)

Pain.

When pain is the chief complaint, it is important to determine whether it is chronic or acute. (28)

The distribution of the pain is also important. Patients with acromioclavicular joint pain will typically (but not always) point directly to the joint, whereas rotator cuff pain tends to be more global or into the deltoid. Inflammation and stiffness of the shoulder can both cause pain to radiate down the arm; however, radiation down the arm to the hand should raise the suspicion of cervical disc disease. (25)

Pain in the medial shoulder blade area is common, and the differential diagnosis includes thoracic outlet syndrome, a lung process, a rib problem, cervical disc disease, and, rarely, degenerative or pathological process of the thoracic spine. Medial shoulder blade pain may be due to incorrect use of the shoulder blade secondary to an intrinsic problem in the shoulder. In this case the patient is using the muscles of the shoulder blade to elevate the shoulder, and the increased or abnormal stress causes muscles to fatigue and pain; however, the diagnosis of muscle pain in the medial scapular region should be a diagnosis of exclusion once other conditions have been ruled out. (25)

An attempt to define positional relationship is important. For example, patients who feel most of their pain while working in overhead positions may have an impingement problem. Patients who find it difficult to throw a ball or otherwise attain the cocking position of abduction/external rotation often will have instability. With acute pain that is severe with no trauma, the inability to move the arm in all ranges of motion without pain is highly suggestive of an acute bursitis. With chronic and insidious cases, it is important to determine the extent to which overuse or misuse is a culprit. (28)

Pain in multiple areas, particularly when not associated with any specific pattern, can be due to a severely inflamed shoulder. Included in the differential diagnosis of diffuse pain should be connective tissue disorders such as polymyositis, lyme disease medication myalgias and fibromyalgia. (25)

What makes pain worse can be helpful in determining the diagnosis, but is not diagnostic for any one entity. Pain at night is a worrisome sign, especially if it occurs without the patient rolling over or lying on the shoulder. Progressive pain is also a red flag, especially if it continues to increase despite treatment. Pain that progresses to the

need of narcotics suggest that there may be a more serious etiology of the pain. What motions aggravate the pain can be of some assistance in making the diagnosis, as well as what makes the pain better. (25)

Chest and rib pain not directly in the shoulder itself should prompt the examiner to inquire about shortness of breath or symptoms of angina. Angina pain may radiate into the neck and down the arm, and the patient may place his or her hand over the region of the heart as the source of the pain; this is referred to as the "Levine Sign". Pain along the chest and medial to the midclavicle may be seen with sternoclavicular problems, but the differential diagnosis for anterior chest wall pain more typically includes thoracic outlet syndrome or cervical disc disease. Pain in the axilla or ribs below the shoulder is uncommon, but the differential diagnosis includes a pathological rib process, a pulmonary problem, or thoracic outlet syndrome. (25)
The dominance of the extremity can have significant implications for the treatment. Many patients live with a disability in the nondominant extremity that would be unacceptable in their dominant shoulder. (28)

The following are possible causes of pain based on location: (28)

PLACE OF PAIN	TRAUMATIC	NONTRAUMATIC
Anterior	Fracture, dislocation, subacromial bursitis, capsular strain, rupture of long head of biceps, labrum tear.	General impingement syndrome, subcoracoid impingement, biceps tendinitis, subacromial bursitis, subscapularis tendinitis, subluxation.
Lateral	Contusion, supraspinatus rupture, referral from cervical spine or brachial plexus injury.	Impingement syndrome, deltoid starin, supraspinaus tear or rupture, referral from cervical spine problem.
Superior	Acromioclavicular separation, distal clavicular fracture, shoulder pointer.	Osteoarthritis of the acromioclavicular joint, osteolysis of the distal clavicle.
Posterior	Scapular fracture, posterior dislocation.	Posterior impingement syndrome, infraspinatus or teres minor strain or tendinitis, posterior deltoid strain, triceps strain, suprascapular nerve entrapment.

(fig.5)

Weakness.

Weakness of the shoulder or upper extremity is considered a neurologic complaint until proven otherwise. Weakness can be due to intrinsic shoulder problems, but it is imperative that the practitioner be considering other possible etiologies or combinations of etiologies causing the weakness. There has been patient presented given diagnosis of rotator cuff dysfunction but who had weakness of the shoulder as primary complaint. No history of trauma, with a history of painless weakness. In one case this turned out to be cervical tumor, and another ALS (amyotropic lateral sclerosis). (25)

The sense of weakness or instability may be an isolated or associated complaint. It is important to discover past traumas, in particular dislocations or medical subluxations. If not rehabilitated, a progressive looseness of the capsule frequently develops. This may lead to concomitant damage to the labrum, resulting in a downward spiral. Another possibility is peripheral nerve damage such as suprascapular nerve involvement. Evidence is usually visual with athrophy of the infraspinatus evident. When there is associated neck pain and painless weakness of the shoulder, consider and test for nerve root involvement. If there is no past trauma or surgery, consider the possibility of an inherent looseness of the shoulder capsule, which is likely a bilateral phenomenon. This is best determined with orthopedic testing for instability. (28)

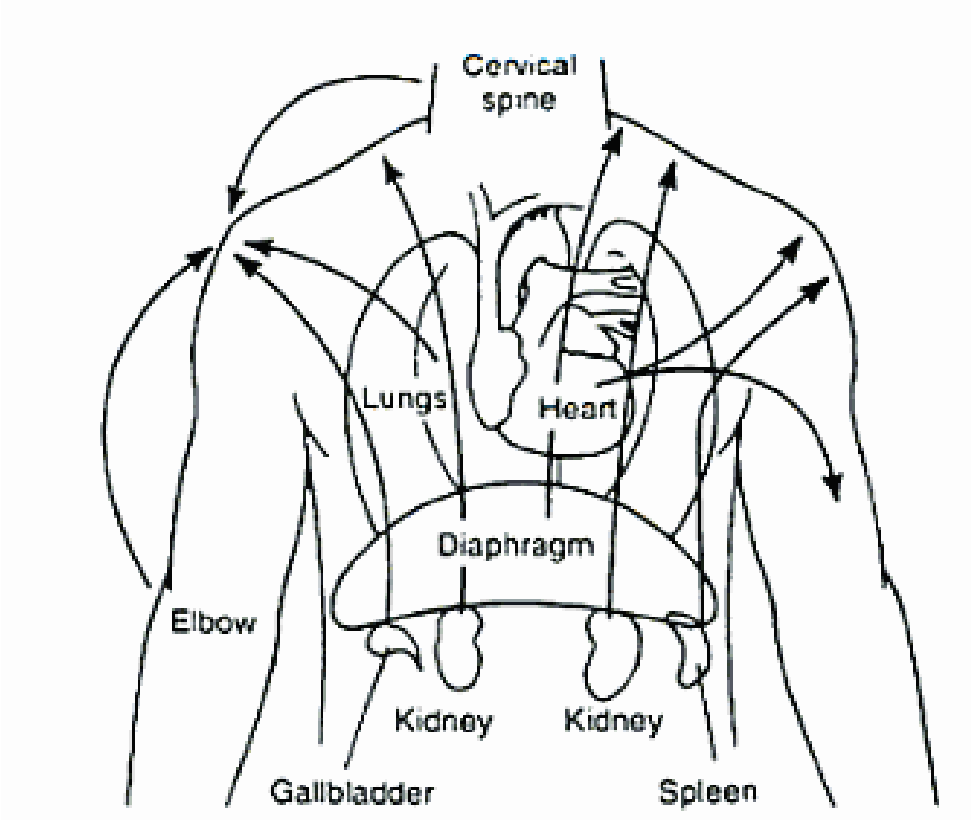
Restricted movement.

With a complaint of stiffness, it is important to determine the sequence of events leading to the sense of restriction. For example, a patient complaining of an acute, unprovoked episode of incapacitating shoulder pain that lasted for weeks before resolving into stiffness is likely to have adhesive capsulitis. A patient with a past traumatic history (especially a posteriorly directed force to the humerus) must be suspected of having a posterior dislocation. Those with a history of trauma or surgery might be expected to develop an early onset of osteoarthritic changes. In those with coexisting arthritides the shoulder may be a secondary area of involvement. In addition to osteoarthritis, the most common arthritides that involve the shoulder are rheumatoid arthritis and ankylosing spondylitis. All of the above causes are likely to result in stiffness in many planes. A single movement plane of stiffness must be qualified. Restriction due to pain and weakness is likely caused by a mechanical block resulting from bone or labrum pathology. If there is overuse or trauma to muscle, subsequent scarring may lead to an obvious restriction in the direction of stretch. (28)

Other complaints. Atrophy or deformity is sometimes the primary concern of patients. Atrophy of the infraspinatus is evident by depression over the scapula. This is most often due to suprascapular nerve damage, not uncommon in overhead sports, in particular volleyball. If the patient complains of a mass in the distal arm, rupture of the long head of the biceps should be considered. The patient often will report of an injury during which a pop was heard. Another cause of mass in the arm is myositis ossifications. The patient will report having been struck on the arm, with subsequently swelling that never resolved. Radiographs will reveal the calcified muscles mass. Deformity at the top of the shoulder is often due to the instability of an acromioclavicular separation or a distal clavicular fracture when trauma is reported. Without trauma and in an older individual, osteoarthritis of the acromioclavicular joint is likely. (28)

Referred pain.

Visceral diseases causing pain in shoulder summarized; (25)



(pic.2)

RIGHT SHOULDER	
Systemic origin	**Location**
Peptic ulcer	Lateral border scapula, right
Myocardial ischemia	Right shoulder down arm
Hepatic/billary acute cholecystitis	Between scapulae, more to right side
Liver abscess	Right shoulder
Gallbladder	Right upper trapezius
Liver disease	Right shoulder and right subscapula
Pulmonary diseases	Ipsilateral shoulder, upper trapezius
Kidney	Ipsilateral shoulder

(fig.6)

LEFT SHOULDER	
Systemic origin	**Location**
Ruptured spleen	Left shoulder (Kehr`s sign)
Myocardial ischemia	Left pectoral(left shoulder)
Pancreas	Left shoulder
Ectopic pregnancy, rupture	Left shoulder (Kehr`s sign)
Pulmonary diseases	Ipsilateral shoulder, upper trapezius
Kidney	Ispilateral shoulder
Postoperative laparoscopy	Lefts houlder (Kehr`s sign)

(fig.7)

Examinations:

In addition to detailed anamnesis the examinations to achieve correct diagnosis should firstly include observation of patient position and shoulder contour. Palpation of the shoulder may be revealing for many common shoulder complaints with tenderness and deformity to specific areas or tissues. (28)

Range of motion measurements should be performed, and some characteristic movement pattern restrictions are as follows; (28)

- Pain in the midrange of abduction is referred to as a “painful arch”. The painful arch is between 70 degrees and110 degrees. To qualify as a painful arch the pain must be less above this range. When patients cannot actively move beyond this range, the examiner should assist the patient to 120 degrees and then ask pastient to continue if possible. In general, and active painful arc combined with a negative passive painful arc is suggestive of a contractile lesion (i.e muscle/tendon). If a painful arc is felt on active and passive movement, the involved structures are less clear.

MOVEMENT	POSSIBLE DIAGNOSIS
Patient is unable to perform most movements due to pain and has no history of trauma.	Likely to have either an acute bursitis or the initial stage of adhesive capsulitis.
History of trauma and the patients avoids any attempt at movement	Consider dislocation and/or fracture
History of trauma and the patient is unable to lift the arm into flexion with a supinated arm	Posterior dislocation should be considered
Restriction in both active and passive movement preferentially affecting external rotation, abduction and then eventually extension and flexion	Suggests adhesive capsulitis.
Pain felt at a discrete point with active R.O.M as a sharp pain	Suggestive of a labrum tear, especially if it can be relieved by avoiding the specific position
Inability to lower from an abducted position (drop arm test)	Suggestive of a rotator cuff (specifically supraspinatus) tear.
The use of body leaning or shoulder hunching	Often visible when patients with adhesive capsulitis, rotator cuff tear or osteoarthritis are compensating for weakness or loss of active movement.

(fig. 8)

Typical picture.

Following is a table of typical symptoms of the common shoulder problems. (8)

DIAGNOSIS	SIGNS and SYMPTOMS
Referred pain from cervical area (eg. C5 radicular pain from nerve root encroachment)	Shoulder motion shows painless complete arc; no specific periarticular shoulder tender points, but muscle spasm may be present. Neck rotation or neck compression testing typically triggers radicular pain distally in C5dermatom.
Subacromial bursitis and noncalcific supraspinatus tendonitis.	Painful shoulder motion, especially between 60-120 degrees of active abduction, tender subacromial region; pain may partially radiate in C5 dermatome.
Bicipital tendinitis	Localized anterior shoulder pain over long head of biceps tendon; with forearm supination, tendon sheat is tender with thumb rolling. Motion is normal.
Supraspinatus tendon tear or rupture	Following trauma in younger patients, abrupt pain and weak or absent active abduction. More gradual onset of pain and weakness in older patients. Small tears may mimic tendinitis symptoms.
Adhesive capsulitis	Gradual onset of diffuse painful shoulder markedly restricted passive and active motion in all planes.
Acromioclavicular joint disorder	Shoulder arc painful but limited only during last 20 degrees of abduction. The joint is tender and prominent compared with contralateral side if separation or osteophytes are present.
Impingement syndrome	Impingement typically begins after 60-70 degrees and is max between 100-1200 degrees of abduction. Recurrent pain from compression of subacromial tissue also occurs at 90-100 degrees of forward flexion.

(fig. 9)

3. Special Part – Case Study.

3.1 Methodology

My case study took place at Centrum Léčby Pohybového Aparátu Vysočany, Prague, from 08.02.10 until 19.02.10. This is a rehabilitation center specialized in adult orthopedic injuries and sports traumatology. The center provides a wide range of physiotherapeutic care for musculoskeletal injuries for both inpatients and outpatients. They offer individual treatments, electrotherapy, hydrotherapy and group exercises.

My study was supervised by Mgr. Zaher El Ali and all examinations and therapeutical procedures were done in cooperation with him.

My patient was informed from the beginning of her appearance in my thesis, and the work has been approved by the Ethics Committee of the Faculty of Physical Education and Sport at Charles University, Prague.

I had 8 sessions with my patient, spread over a two week period, mostly of 30 minute duration each.

3.2 Anamnesis

Performed 08.02.10.

Name: T.K - female

Year of birth: 1961

Diagnosis: Adhesive Capsulitis, left shoulder joint.

Classified, by Mgr. Zaher El Ali, as Stage 2 Adhesive Capsulitis.

Findings on entry exam:

BMI: 23

Height: 165m

Weight: 65kg

Chief complaint:

Patient complains of limited movement and stiffness in left shoulder joint. In addition to this there is muscle pain of varying degree between left shoulder and left elbow. The pain is not constant and mostly arrives during movement. The exact place of the pain varies and the movements provoking the pain also vary from day to day.

Patient describes the pain as mostly shooting.

History of present problem:

In October 2009 the pain in left shoulder occurred with acute character while patient was putting on her jacket in her home. This activity done with extension and internal rotation in the shoulder joint. The pain disappeared after a short while and the patient forgot about the incident. After some weeks a weaker pain again occurred accompanied by increasing stiffness and limited range of motion in the left shoulder. She was away on travel and did not see a doctor until 04.01.10.

During November/December the patient used a rowing machine at home that she felt helped her shoulder pain.

Psychosocial history:

Patient is not married, but has a partner.

Lives alone, and has no children.

She expresses that she does not have any problems with ADL, and that she is able to perform all necessary activities with her right hand.

Work: Patient works as a guide and runs her own traveling agency. She is at the moment not working due to the shoulder pain. A normal day includes several hours at the computer. She sits on her couch with the lap-top on her lap and with feet on the table. She expresses herself that the position is not of good quality.

Hobbies: She is at the moment not engaged in any sports, but plans to start attending fitness center when her shoulder functions improve. She enjoys travelling.

Personal/medical history:

Diseases: Low blood pressure.

No history of virosis, rheumatology or gastrointestinal problems. The patient states that she "has never really been sick before".

Operations: No

Gynecological: No

Family history:

N/A

Medications:

No.

Patient was on pain medications in January 2010, but is not at the present time.

Previously used medications associated with the condition to left shoulder:

- Movalis 20mg
- Voltaren Gel, applied to shoulder areas
- Nimezil
- Elmetacil Spray

In January 2010 patient had had injections to left shoulder joint, with combination of analgetics and corticosteroids. She prefers not to take medications.

Abuses:

Smoking: No

Alcohol: Rarely

Drugs: No

Previous rehabilitation:

After the first visit to the doctor 04.01.10 patient was prescribed 9 sessions of Magnetotherapy at CLPA. Patient expresses that at the moment of therapy she felt pain relief, but after arriving back home the pain occurred again and then of a worse character then before the therapy. She was not satisfied with this therapy.
Later she was sent for therapy with Physiotherapist Mgr. Zaher El Ali, also at CLPA. This therapy is still in progress, and patient is satisfied and feels progress.
As of today she has had a total of three sessions.

Indication for rehabilitation:

Reduce pain in left shoulder.

Remove swelling of left shoulder.

Treat the affected soft tissues.

Increase the R.O.M in left shoulder

Change faulty posture.

Change faulty movement patterns.

Differential considerations:

- Impingement syndrome
- Rotator cuff disease/tear
- Other common shoulder pathologies, as mentioned in part 1, needs to be excluded.
- Local lesions if soft tissue and joint do to reflex action from visceral organs, especially in this case pancreas, spleen, ipsilateral kidney and lung.

As in this case when the medical doctor has stated the diagnosis, we can exclude any traumatic pathological state inside the joint. But for other times when diagnosis has not been set traumatic events also need to be excluded during the process of anamnesis and examination.

Further, the patient's posture, stability and movement stereotype needs to be considered as this might be an important factor in her state. Instability needs to be checked as well as movement patterns. There might be compensation for the pain, and also compensation of the restricted movement that might result in faulty patterns.

Secondary lesions might be present in trunk and neck muscles in regard to protective mechanisms of the painful shoulder. All surrounding tissue to shoulder and scapula might be in a changed state, as hyper or hypo tone or possible weakness. Over activity of surrounding muscles might lead to triggerpoints.

The healthy extremity might have been under compensatory mechanism to aid the painful arm. Muscles and joints of this extremity must be looked at to exclude any compensation and to prevent development of pathology also in this extremity.

Important to evaluate if there is capsular pattern of restriction, or painful arc.

3.3 Initial Kinesiological Examination:

Examination was performed 08.02.10.

All examinations were done in regard to the specific diagnosis of my patient, and due to the minimal amount of time available all other examination were excluded.

Aspection:

Skin color	Normal
Lip color	Normal
Sweat	Normal
Turgor	Normal

(fig.10)

Other observations:

Patient undresses to underwear without help, but her left arm is not used. As she lies down on the bench she fiddles a lot and protects her left arm by the use of her right one. She does not roll from prone to supine or vice versa without going to kneeling position first. She has adapted her pattern of dressing and undressing to the shoulder stiffness and pain.

Posture: (4)

Anterior view:

- Left shoulder higher then right shoulder, severely.
- M. Upper Trapezius very prominent bilaterally, worse on left side.
- Small internal rotation of arms, bilateral.
- Fingers semi-flexed left side.
- Trunk shift to left side.
- External rotation in ankle, bilateral.
- Small standing base.
- Decreased transverse and longitudinal arch of foot, bilateral.

Lateral view:

- Forward head position.
- Prominent TH1. (palpated)
- Cervical lordosis increased.
- Protracted shoulders bilaterally.
- Flat thoracic spine.
- Prominent lower abdomen.

Posterior view:

- Scapula alata, bilateral.
- Internal rotation of lower angle scapula bilaterally.
- Right shoulder more anteriorly, and shoulders are rotated to the left side.

Palpation: (4)

	RIGHT			LEFT		
	Tone	Triggerpoint	Pain	Tone	Triggerpoint	Pain
UpperTrapezius	hyper	YES	YES	hyper	YES	YES
Levator Scapulae	hyper	NO	YES	hyper	NO	YES
Subscapularis	**hyper**	**YES**	**YES**	**hyper**	**YES**	**YES**
Supraspinatus	norm	NO	NO	norm	NO	NO
Infraspinatus	norm	NO	NO	norm	NO	NO
Deltoid	**norm**	**NO**	**NO**	**hyper**	**NO**	**YES**
Biceps Brachii	norm	NO	NO	Hypo	NO	NO
Triceps Brachii	norm	NO	NO	hypo	NO	YES
Sternocleidomastoid	hyper	NO	YES	hyper	NO	YES
Scalenes	hyper	NO	YES	hyper	NO	YES

(fig.11)

In addition to this there is palpated swelling around shoulder joint, especially superior to, and underneath left clavicle.

Soft tissue restrictions are palpated in upper back over areas of scapula.

Sensation:

Of both upper extremity.

Feeling of touch	Normal
Stereognosia	Normal
Movement sensation	Normal

(fig.12)

Breathing:

Patient has upper thoracic breathing, and barely visible breaths. There is hardly any visible movement of abdomen or ribs, in both standing and supine position, during breathing. Small activity can be seen in m. Upper Trapezius, upper chest and neck areas. Thoracic cage is inactive in breathing.

Movement pattern examination: (according Janda)

ABD shoulder joint	Faulty pattern. Large elevation of shoulder starting at appox. 45 degrees of left arm and at 60 degrees of right. When moving further with left arm there is trunk lean to right side.
Push up	Faulty pattern. Elevation of both shoulders, high activity of upper trapezius and scapula alata. Inability to hold trunk in correct straight position.

(fig.13)

R.O.M measurements: (4)

	Left upper extremity		**Right upper extremity**	
Movement	**Active**	**Passive**	**Active**	**Passive**
Shoulder Flexion	90 º	80º	170 º	175 º
Shoulder Extension	5 º	5º	45 º	45 º
Shoulder ABD	35 º	30 º	180 º	180 º
Shoulder ER	0 º	0 º with pain	90 º	90 º
Shoulder IR	10 º	10 º	70 º	70 º
Elbow Flexion	160 º	160 º	160 º	160 º
Elbow Extension	0 º	0 º	0 º	0 º
Wrist Dorsiflexion	80 º	90 º	80 º	90 º
Wrist Palmarflexion	80 º	90 º	80 º	90 º
Wrist Radial duction	15 º	20 º	15 º	20 º
Wrist Ulnar duction	45 º	45 º	45 º	45 º

(fig.14)

Strength test: (4)

Muscle	**Right**	**Left**
Biceps Brachii	5	5
Triceps Brachii	5	4
Serratus Anterior	3+	3+
Internal rotators of shoulder, group test	4	3+ with pain
External rotators of shoulder, group test*	4	4
Abdominal muscles, trunk curl	4**	
Gluteus maximus	3+	

(fig.15)

**Modified test due to painful starting position. The test was performed in sitting position, and with elbows along trunk.*

*** Abdomen is in shape a balloon when tested, reflecting that deep stability is poorly activated and rectus abdominis is main worker.*

Others Tests:

Vele Test: negative

Trendelenburg: normal

Scale Measurements: equal

Active movements:

- Trunk extension: normal
- Trunk lateral flexion: normal
- Head flexion: 3 fingers between sternum and chin
- Head extension. normal
- Head lateral flexion: left 20, without rotation. Right 25,without rotation.
- Head rotation: 80 degrees.

Joint Play examination: (upper extremity) (21)

NR = No restriction

Interphalangeal joints (proximal and distal):

Interphalangeal joint, right upper extremity					
Digit	**1st**	**2nd**	**3rd**	**4th**	**5th**
Dorsopalmar	NR	NR	NR	NR	NR
Laterolateral	NR	NR	NR	NR	NR
Rotation	NR	NR	NR	NR	NR
Lateral	NR	NR	NR	NR	NR

(fig.16)

Interphalangeal joint, left upper extremity					
Digit	**1st**	**2nd**	**3rd**	**4th**	**5th**
Dorsopalmar	NR	NR	NR	NR	NR
Laterolateral	NR	NR	NR	NR	NR
Rotation	NR	NR	NR	NR	NR
Lateral	NR	NR	NR	NR	NR

(fig.17)

Metacarpophalangeal joints 2-5th digit

Metocarpophalangeal joints 2-5th digit, right upper extremity				
Digits	2nd	3rd	4th	5th
Dorsopalmar	NR	NR	NR	NR
Laterolateral	NR	NR	NR	NR
Rotation	NR	NR	NR	NR

(fig.18)

Metocarpophalangeal joints 2-5th digit, left upper extremity				
Digits	**2nd**	**3rd**	**4th**	**5th**
Dorsopalmar	NR	NR	NR	NR
Laterolateral	NR	NR	NR	NR
Rotation	NR	NR	NR	NR

(fig.19)

Metacarpophalangeal joint of the thumb

	Right thumb	**Left thumb**
Dorsopalmar	NR	NR

(fig.20)

INTERCARPAL JOINTS	**Right side**	**Left side**
Palmar	NR	NR
Palmar, lateral segments	NR	NR
Pisiform	NR	NR
Schapoid	NR	NR
Capitate	NR	NR
One carpal to the other	NR	NR

(fig.21)

RADIOCARPAL JOINT	**Right side**	**Left side**
Dorsal direction	NR	NR
Dorsal direction, radial side	NR	NR
Dorsal direction, ulnar side	NR	NR
Proximal row, radial direction	NR	NR

(fig.22)

DISTAL RADIOULNAR JOINT	**Right side**	**Left side**
Shearing	NR	NR

(fig.23)

ELBOW JOINT	**Right side**	**Left side**
Radial	NR	NR
Ulnar	NR	NR
Head of radius, ventral	NR	NR

(fig.24)

SHOULDER JOINT	**Right side**	**Left side**
Ventral	NR	NR
Dorsal	NR	Not possible due to pain
Caudal	NR	Not possible due to pain
Lateral	NR	NR

(fig.25)

ACROMIOCLAVICULAR JOINT	Right side	Left side
Ventrodorsal	NR	NR

(fig.26)

STERNOCLAVICULAR JOINT	Right side	Left side
Springing distraction	NR	NR

(fig.27)

Antropomotoric measurements:

	RIGHT upper extremity	LEFT upper extremity
Circumference upper arm	33cm	31cm
Circumference forearm	26cm	26cm

(fig.28)

Summary:

- Superficial and deep sensation of upper extremities is not affected.
- Joint play is not affected; although not all directions could be tested the mobility of the joint play itself seems unaffected.
- Small swelling of the left shoulder joint is present. This not being typical for the frozen shoulder might show that something inside the joint has been damaged, as a structural pathology of ligament etc. Since that patients has been seen by medical doctor just before starting therapy I will not make any other assumptions and only follow the doctors indication to treat the swelling my soft massage. If swelling does not subside within the first days I will refer her to see medical doctor again concerning this observation.

- Examination show faulty posture, faulty movement patterns and breathing pattern. It is clear from both the anamnesis and examination that the patient needs instruction in ergonomics of working environment, and education in postural and remedial exercises to keep optimal functions.
  The faulty movement patterns show marked inactivity of m. Serratus Anterior, and the strength tests confirm that m. Serratus Anterior is weak. Other stability and posturally important muscles, as abdominals and gluteals, are also weak. All this confirming that postural functions are poor and need to be improved.
  Vele-test also confirms that proprioception and stability of the whole organism is poor.

- She also shows a shift of the trunk toward the left side, accompanied with a rotation in shoulder, also toward left side. The neck has clearly restricted R.O.M, and the active movements show large amount of faulty movement patterns also here.

- Hypertone and pain of m. Upper Trapezius and m. Levator Scapulae, accompanied with the large elevation of left shoulder, may prove that there is/has been a protective mechanism in regard to the pain she has experienced in the left shoulder. This change in pattern and posture must be changed so that the protective mechanism will not persist after the pain and stiffness has been improved.

- R.O.M is affected to a large extent, and the stiffness is accompanied with pain during movement, and especially when reaching the barrier. The barrier is hard. R.O.M of ABD and E.R of the left shoulder is especially affected, and this also being characteristic for the patients specific diagnosis.

- Palpations show hypertone and pain of m. Subscapularis and m. Deltoid, typical for Adhesive Capsulitis.

- Anthropometry shows dystrophy of left upper arm, not to a large extent, but 2cm difference of the upper arms may show us that the lack of use is affecting the muscle size directly. Something that to a large extent needs to be prevented.

Regarding the differential consideration, Impingement Syndrome, we can exclude that diagnosis when we see this type of restricted R.O.M. If impingement syndrome was the correct diagnosis we would see more mobility in the affected shoulder joint, accompanied with more affected joint play.

3.4 Rehabilitation Plan:

Short-term rehabilitation plan:

- Decrease swelling around left shoulder joint by use of soft techniques and massage.
- Decrease pain in left shoulder by relaxation techniques to surrounding muscles and to joint itself.
- Increase R.O.M of left shoulder by mobilization techniques and relaxation of surrounding tissues.
- Treat the affected soft tissues, for hypotone/hypertone and dystrophy.
- Prevent further contractures and protective mechanisms.

Long-term rehabilitation plan:

- Work on changing faulty posture and movement patterns by educating patient in correct positions and posture.
- Work on deep stabilization by use of remedial exercises.
- Work on changing breathing pattern and awareness of breathing style.
- Ergonomics and "back-school" for better prevention of further development of faulty patterns and posture.
- Introduce patient to regular exercise for prevention of further injuries/disorders.

3.5 Therapy progress

Day to day therapy:

Date: 08.02.10

Time of day: 09.30

Status presens:

Subjective:

Patient feels better then days before, and feels that therapy is effective in regard to pain feeling and stiffness of the left shoulder joint.

Objective:

Active ABD left shoulder	30 degrees
Pain level on a scale from 1-10	4, not constant.

(fig.29)

Objective of today's therapy unit:

Decrease swelling around left shoulder joint.

Work on improving R.O.M of left shoulder.

Decreasing tension in affected soft tissues.

Instructions for auto-therapy exercises.

Therapy proposal:

Soft tissue techniques for relaxation of affected tissues, and decreasing of swelling.

Mobilization techniques for the shoulder joint to improve R.O.M and decrease stiffness.

Remedial exercises for improving scapula stability.

Therapy execution:

1. Soft tissue techniques for back and shoulders, according Lewit. (21)
2. Kibler`s Fold for back and shoulder areas. (21)
3. Stretching of dorsal fascia over scapula, according Lewit. (21)
4. Mobilization of left scapula against the thoracic wall, according Lewit. (21)
5. Mobilization of left acromioclavicular joint by springing in craniocaudal direction, according Lewit. (21)
6. P.I.R to m. Subscapularis of left shoulder, modified, according Lewit. (21)
7. Exercises for scapula stability; push up against the wall. Patient is instructed to do 3 sets of 10 at home each day. (22)

Conclusion of today's unit:

After ended therapy patient feels some relief of tension in the shoulder. The swelling has decreased after the use of soft tissue techniques to the areas.
Relaxation into E.R in left shoulder was felt by the physiotherapist during P.I.R. The improvement was not measureable, but felt.

Day to day therapy:

Date: 09.02.10
Time of day: 09.30

Status presens:

Subjective: patient is happy as the therapy is giving pain relief and what she expresses as good results.
Objective: Today no measures were made.

Objective of today's therapy unit:

Exercise to improve scapula stability.

Therapy proposal:

Exercises for scapula stability and shoulder rotation.

Therapy execution:

1. Push-ups against wall in standing position. 3 sets of 10 repetitions. (22)
2. Exercise, sitting on ball, with use of Thera-Band on hands for shoulder rotation. 3 sets of 7 repetitions were done. (22)

Conclusion of today's unit:

Today's session was short and focused on exercises and education of the patient. Patient was instructed to perform correct movements and is now also aware of how the use of regular exercising will improve her state. She will continue the exercises at home by herself in addition to the therapy given by physiotherapist.
All exercises were performed with good quality and character without pain being provoked.

Patient states she can feel the activation of the muscles, and how they "haven't been used for a while"

The education of the patient in posture and position needs to be continued during our therapy as she seems to not fully believe that there is anything faulty about her posture. She has difficulty seeing that the whole body will work as one large entity, and that weak muscles will affect her posture, and that a faulty posture will give her pain in the long run.

Day to day therapy:

Date: 10.02.10

Time of day: 09.30

Status presens:

Subjective:

She had pain during the night in area of Acromion and m. Triceps Brachii tendon. She is not sure if the pain is soreness from doing exercises, or related to stiff shoulder. She expresses the pain as mild.

Objective:

Active ABD left shoulder	30 degrees
Pain level on a scale from 1-10	5, constant.

(fig.30)

Objective of todays therapy unit:

Work on left shoulder mobility.

Exercise to change the faulty movement patterns of scapula and upper extremity.

Awareness of bad posture and movement pattern.

Therapy proposal:

Relaxation of affected tissues around neck and left shoulder.

Mobilization techniques of scapula.

Relaxation techniques for internal rotators of shoulder to improve external rotation of left shoulder.

Therapy execution:

1. Soft tissue techniques to back and shoulder areas, also to m.Triceps Brachii.
2. Stretching of dorsal facia over scapula, according Lewit. (21)
3. Mobilization of scapula against Thoracic wall, according Lewit. (21)
4. P.I.R to m. Upper Trapezius, according Lewit (21)
5. P.I.R. to m. Levator Scapula, according Lewit. (21)
6. P.I.R to m. Subscapularis of left shoulder, modified, according Lewit. (21)
7. Review of auto-therapy exercises from previous sessions.
    - Push-up against wall (22)
    - Thera-band exercise on ball (22)

Conclusion of today's unit:

The mobility of scapula against thoracic wall is good, and the patient expresses that this mobilization gives her relief of pain. The active movements of left shoulder show a very faulty movement pattern with high activity of m. Upper Trapezius. The activity of m. Serratus Anterior is poor, and the patient was educated in correct pattern of motion in front of mirror.

Day to day therapy:

Date: 11.02.10

Time of day: 09.30

Status presens:

Subjective:

Today the patient feels worse. The pain is located inside the shoulder joint; it is not radiating or shooting. The pain is constant and was worse during the night. She suspects the pain to have come due to her sleeping position last night.

Objective:

Active ABD left shoulder	30
Pain level on a scale from 1-10	8, constant.

(fig.31)

Objective of today's therapy unit:

Relaxation of muscles of left shoulder and neck.

Mobilization of left shoulder joint.

Therapy proposal:

Soft Tissue techniques for relaxation of neck and back facia.

Relaxation of affected muscles in left shoulder and neck.

Mobilization of left scapula and shoulder.

P.I.R for relaxation of internal rotators of left shoulder joint to improve R.O.M into external rotation.

Therapy execution:

1. Soft tissue techniques for back areas
2. Stretching of dorsal fascia over scapula, according Lewit. (21)
3. P.I.R for m. Levator Scapula, according Lewit. (21)
4. P.I.R for m. Upper Trapezius, according Lewit. (21)
5. P.I.R m.Scalene, according Lewit. (21)
6. P.I.R m. Sternocleidomastoid, according Lewit. (21)
7. P.I.R for m. Subscapularis, modified, according Lewit (21)
8. P.I.R for external rotators of shoulder as a group, according Lewit. (21)
9. Mobilization of scapula against the thoracic wall, according Lewit. (21)
10. Mobilization of thoracic spine clockwise and counterclockwise, according Lewit. (21)
11. Exercise for centralization of scapula, according Capova.

Conclusion of today's unit:

After the therapy patient felt release of some stiffness and pain in the shoulder. She expressed that she felt much better than before the session.

The previous severe elevation of her left shoulder was also drastically improved after today's therapy.The patient was instructed to do both P.I.R for m. Subscapularis and the centralization exercise from Capova as auto-therapy.

Day to day therapy:

Date:12.02.10

Time of day:09.30

Status presens:

Subjective: Today she feels relaxation in the shoulder, and less pain then yesterday. She expresses that yesterday's therapy seemed to be successful.

Objective:

Active ABD left shoulder	
Pain level on a scale from 1-10	5, not constant.

(fig.32)

Objective of today's therapy unit:

Relaxation techniques for shoulder and neck muscles.

Mobilization of scapula and shoulder.

Education in proper sitting and working positions, ergonomics.

Therapy proposal:

P.I.R for rotators of shoulder for relaxation of muscles to improve mobility.

Relaxations techniques for back, neck and shoulder areas.

Therapy execution:

1. Soft Tissue Techniques; massage and Kibler's Fold to back and neck.
2. Stretching of dorsal facia over the scapula, according Lewit. (21)
3. Mobilization of scapula against thoracic wall, according Lewit. (21)
4. P.I.R for m. Subscapularis, modified, according Lewit. (21)
5. P.I.R for external rotators as a group, according Lewit. (21)
6. P.I.R for m. Upper Trapezius, according Lewit. (21)
7. P.I.R for m. Levator Scapulae, according Lewit (21)
8. P.I.R m. Scalene, according Lewit. (21)
9. P.I.R m. Sternocleidomastoid, according Lewit. (21)
10. Exercise for scapula centralization, according Capova.

Conclusion of today's unit:

She expressed that after this therapy she felt more "freedom of the joint".

The exercise from Capova was used as an exercise and also as instruction on how shoulder, scapula and trunk should be situated in a working position at a desk. Further the patient was shown good sitting position and working position. We agreed that this exercise could be applied in her daily routines like working on the computer, cooking and brushing teeth.

Conclusion of this week of therapy:

During the week there has been no measurable improvement of the R.O.M, but the patient feels less stiffness in the left shoulder and the pain has decreased.
Swelling is no longer visible around the left shoulder joint. The sever elevation of left shoulder has also been improved during this week.

The therapy comprised of the combination of Soft Tissue Techniques, P.I.R to neck muscles and shoulder rotators, mobilization of the scapula and remedial exercises for stability seem to be successful. The patient is having a good experience from the therapy, and so far no pain has been provoked by the therapy.

As the patient is in stage two of her diagnosis I will continue this therapy and not push further in regard to exercises to improve hypotone or mobilizations to improve the R.O.M in left shoulder joint.
Trying to prevent further contractures or soft tissue lesions will be my main point for the next week. After that the education of patient will be prioritized. She needs to be aware of her faulty patterns and posture. A lot of time of the therapy will also be used for this aspect, as she does not seem to trust me completely in regard to this.

Day to day therapy:

Date: 15.02.10

Time of day: 09.30

Status presens:

Subjective: Patient feels good, and expresses that the feeling of stiffness is decreasing. She has been working this weekend, as a guide, for the first time in weeks and it went good in regard to the left shoulder.

Objective:

Active ABD left shoulder	30
Pain level on a scale from 1-10	4, not constant.

(fig.33)

Objective of today's therapy unit:

Relaxation of the affected soft tissues.

Stability exercises.

Improving patient's awareness of her posture.

Educating patient in the aspects of the quality of the exercises she does as auto-therapy.

Therapy proposal:

P.I.R for shoulder and neck muscles.

Scapula stability exercises in the gym with focus on patient awareness of position, posture and movement quality in front of mirror.

Therapy execution:

1. Soft Tissue Techniques to upper back, neck and shoulder muscles.
2. Kibler`s Fold to back and shoulder areas. (21)
3. Shifting of dorsal fascia over scapula, according Lewit (21)
4. P.I.R for m. Subscapularis,modified, according Lewit. (21)
5. Mobilization of scapula against the thoracic wall, according Lewit. (21)
6. Exercise sitting on ball with thera-band for scapula. 10 repetitions, 2 sets. (22)
7. Exercise bouncing on ball
8. Push up exercise against wall. 10 repetitions, 3 sets. (22)

Conclusion of today's unit:

The patient has a tendency to shift her trunk to the left side, and increase the rotation of trunk toward left side when she is doing the exercises. She is more aware of this now, as we did all exercises in front of a mirror.

Patient has a rowing-machine at home and wants to start using this. We discuss the importance of quality before quantity in regard to this type of exercise.

She is advised to buy a large exercise ball that she can use occasionally to replace a chair when working on the computer. She has difficulty to understand the fact that correct sitting position and working ergonomics will also be an effective exercise for her in regard to her posture and stability.

Day to day therapy:

Date: 16.02.10

Time of day: 15.00

Status presens:

Subjective: She feels good today and has no complaints or changes to express.

Objective:

Active ABD left shoulder	30
Pain level on a scale from 1-10	4, not constant.

(fig.34)

Objective of today's therapy unit:

Treat the affected tissues in neck and left shoulder.

Awareness exercises for breathing pattern.

Therapy proposal:

Soft Tissue Techniques to back and neck areas.

P.I.R for neck and shoulder muscles.

Breathing exercises.

Therapy execution:

1. Soft tissue techniques to upper back and shoulder muscles.
2. Kibler fold to back areas. (21)
3. P.I.R to m. Upper Trapezius, according Lewit (21)

4. P.I.R to m. Levator Scapula, according Lewit. (21)
5. P.I.R m. Scalene, according Lewit. (21)
6. P.I.R m. Strenocleidomastoid, according Lewit. (21)
7. P.I.R to internal rotators of left shoulder joint, according Lewit. (21)
8. P.I.R to m. Subscapularis of left shoulder joint, according Lewit. (21)
9. Exercise for abdominal breathing.
10. Stretching auto-therapy for m. Infraspinatus. (21)

Conclusion of today's unit:

Patient has difficulty to understand why her breathing pattern needs to change. I try to explain the importance of correct activation of muscles and how it all is connected to each other. She does not see the point in changing her pattern, as she expresses that she has never had any problems in relation to her breathing. She does not seem to listen, or understand, that breathing is in correlation to her muscles in neck and shoulder. She does not understand that the muscles of neck may be affected by this faulty pattern, and how her weak abdominal muscles may be exercised if the pattern is changed.
She is visibly uninterested in this exercise and without her active cooperation I will not be able to change, or make her aware, of her faulty pattern.

Day to day therapy:

Date: 17.02.10

Time of day: 09.30

Status presens:

Subjective:

After our session yesterday patient went to see the doctor. The doctor showed her one exercise she could do at home. Standing facing the wall and by fingers "walking" with hands up and down the wall. Both in flexion and ABD in shoulder joint. When she came home she expresses that a pain started to occur in her shoulder. She thinks she might have done "too much".

Objective:

Active ABD left shoulder	30
Pain level on a scale from 1-10	6, not constant.

(fig.35)

Objective of today's therapy unit:

This is the patients last session so focus will be on preparing her for longer duration with only auto-therapy. I want to make sure she remembers all exercises, and that she performs them correctly.

Therapy proposal:

Review all auto-therapy exercises.

Therapy execution:

1. Soft tissue techniques to upper back, neck and left shoulder muscles.
2. P.I.R to m. Upper Trapezius, according Lewit. (21)
3. P.I.R to m. Levator Scapula, according Lewit. (21)
4. P.I.R m. Scalene, accordning Lewit. (21)
5. P.I.R. m. Sternocleidomastoid, according Lewit. (21)
6. Review of auto-therapy exercises:
    - Gravity induced P.I.R into external rotation of shoulder, according Lewit. (21)
    - Scapula stability exercises in supine, according Capova.
    - Push-up exercise against wall in standing position (22)
    - Thera-band exercise for shoulder rotation and scapula stability. (22)
    - Self stretch of m. Infraspinatus (21)

Conclusion of today's unit:

In addition to the five exercises listed the patient was instructed again in the importance of correct sitting and working position. She expresses that she will try to work at a table from now on, and also focus on her posture more. She also in addition wants to use her rowing-machine when she feels that the shoulder can handle it. Regarding the exercise given by the doctor we agree to wait a while before trying this exercise as she feels this is a pain-provoker. She will start using this again when she feels improvement.

3.6 Final Kinesiological Examination:

Performed 17.02.10

Changes from the Initial Kinesiological Examination are marked with the color green.

Aspection:

Skin color	Normal
Lip color	Normal
Sweat	Normal
Turgor	Normal

(fig.36)

Other observations:

The protective mechanism when undressing have decreased. She seems to not be as affected by pain, and pulling sweater on and off goes faster then previously. She still fiddles a lot when finding position on table.

Posture: (4)

Anterior view:

- Left shoulder higher then right shoulder, *not to same extent as previously.*
- M. Upper Trapezius prominent on left side, *but less than previous.*
- Small internal rotation of arms, bilateral.
- Fingers semi-flexed left side.
- Trunk shift to left side, *but patient corrects it herself and is aware.*
- External rotation in ankle
- Small standing base
- Decreased transverse and longitudinal arch of foot, bilateral

Lateral view:

- Forward head position
- Prominent TH1 (palpated)
- Cervical lordosis increased.
- Protracted shoulders bilaterally.
- Flat thoracic spine
- Prominent lower abdomen.

Posterior view:

- Scapula alata, bilateral.
- Internal rotation of lower angle scapula bilaterally
- Right shoulder more anteriorly, and shoulders are rotated to the left side, *but patients is now aware of this and corrects herself.*

Palpation: (4)

	RIGHT			LEFT		
	Tone	Triggerpoint	Pain	Tone	Triggerpoint	Pain
UpperTrapezius	norm	NO	NO	hyper	NO	NO
Levator Scapulae	hyper	NO	NO	hyper	NO	NO
Subscapularis	**hyper**	**NO**	**NO**	**hyper**	**NO**	**YES**
Supraspinatus	norm	NO	NO	norm	NO	NO
Infraspinatus	norm	NO	NO	norm	NO	NO
Deltoid	**norm**	**NO**	**NO**	**hyper**	**NO**	**NO**
Biceps Brachii	norm	NO	NO	Hypo	NO	NO
Triceps Brachii	norm	NO	NO	hypo	NO	NO
Sternocleidomastoid	hyper	NO	NO	hyper	NO	NO
Scalenes	hyper	NO	NO	hyper	NO	NO

(fig.37)

There is no longer any swelling around the left shoulder.

There is no Soft Tissue lesion in areas around scapulas.

Sensation:

Of both upper extremity.

Feeling of touch	Normal
Stereognosia	Normal
Movement sensation	Normal

(fig.38)

Breathing:

Patient has upper thoracic breathing, and barely visible breaths. Patient is now aware of the faulty pattern, and has been instructed in correct pattern. There is at this point no change in spontaneous pattern, but under exercises when instructed patient changes her pattern actively.

Movement pattern examination: (According Janda)

ABD shoulder joint	Faulty pattern, as previously
Push up	Faulty pattern, as previously

(fig.39)

Patterns are still faulty, but patient is aware and has been instructed to correct patterns.

R.O.M measurements: (4)

	Left upper extremity		Right upper extremity	
Movement	**Active**	**Passive**	**Active**	**Passive**
Shoulder Flexion	90 º	90 º	170 º	175 º
Shoulder Extension	15 º	15 º	45 º	45 º
Shoulder ABD	35 º	30 º	180 º	180 º
Shoulder ER	0 º	0 º no pain	90 º	90 º
Shoulder IR	10 º	10 º	70 º	70 º
Elbow Flexion	160 º	160 º	160 º	160 º
Elbow Extension	0 º	0 º	0 º	0 º
Wrist Dorsiflexion	80 º	90 º	80 º	90 º
Wrist Palmarflexion	80 º	90 º	80 º	90 º
Wrist Radial duction	15 º	20 º	15 º	20 º
Wrist Ulnar duction	45 º	45 º	45 º	45 º

(fig.40)

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Strength test: (4)

Muscle	**Right**	**Left**
Biceps Brachii	5	5
Triceps Brachii	5	4
Serratus Anterior	3+	3+
Internal rotators of shoulder, group test	4	3+ with pain
External rotators of shoulder, group test*	4	4
Abdominal muscles	3+**	
Gluteus maximus	4	

(fig.41)

**modified test due to painful starting position. The test was performed in sitting position, and with elbows along trunk.*

*** Still balloon shape and same poor function of deep stabilization.*

Others Tests:

Vele Test: negative

Trendelenburg: normal

Scale Measurements: equal

Active movements:

- Trunk extension: normal
- Trunk lateral flexion: normal
- Head flexion: 3 fingers between sternum and chin
- Head extension. normal
- Head lateral flexion: left 35, without rotation, right 35 without rotation.
- Head rotation: 80 degrees.

Joint Play examination: (upper extremity) (21)

NR = No restriction

Interphalangeal joints (proximal and distal):

Interphalangeal joint, right upper extremity					
Digit	**1st**	**2nd**	**3rd**	**4th**	**5th**
Dorsopalmar	NR	NR	NR	NR	NR
Laterolateral	NR	NR	NR	NR	NR
Rotation	NR	NR	NR	NR	NR
Lateral	NR	NR	NR	NR	NR

(fig.42)

Interphalangeal joint, left upper extremity					
Digit	**1st**	**2nd**	**3rd**	**4th**	**5th**
Dorsopalmar	NR	NR	NR	NR	NR
Laterolateral	NR	NR	NR	NR	NR
Rotation	NR	NR	NR	NR	NR
Lateral	NR	NR	NR	NR	NR

(fig.43)

Metacarpophalangeal joints 2-5th digit

Metocarpophalangeal joints 2-5th digit, right upper extremity				
Digits	2nd	3rd	4th	5th
Dorsopalmar	NR	NR	NR	NR
Laterolateral	NR	NR	NR	NR
Rotatiom	NR	NR	NR	NR

(fig.44)

Metocarpophalangeal joints 2-5th digit, left upper extremity				
Digits	2nd	3rd	4th	5th
Dorsopalmar	NR	NR	NR	NR
Laterolateral	NR	NR	NR	NR
Rotation	NR	NR	NR	NR

(fig.45)

Metacarpophalangeal joint of the thumb

	Right thumb	**Left thumb**
Dorsopalmar	NR	NR

(fig.46)

Intercarpal joints

	Right side	**Left side**
Palmar	NR	NR
Palmar, lateral segments	NR	NR
Pisiform	NR	NR
Schapoid	NR	NR
Capitate	NR	NR
One carpal to the other	NR	NR

(fig.47)

RADIOCARPAL JOINT	**Right side**	**Left side**
Dorsal direction	NR	NR
Dorsal direction, radial side	NR	NR
Dorsal direction, ulnar side	NR	NR
Proximal row, radial direction	NR	NR

(fig.48)

DISTAL RADIOULNAR JOINT	**Right side**	**Left side**
Shearing	NR	NR

(fig.49)

ELBOW JOINT	**Right side**	**Left side**
Radial	NR	NR
Ulnar	NR	NR
Head of radius, ventral	NR	NR

(fig.50)

SHOULDER JOINT	Right side	Left side
Ventral	NR	NR
Dorsal	NR	Not possible due to pain
Caudal	NR	Not possible due to pain
Lateral	NR	NR

(fig.51)

ACROMIOCLAVICULAR JOINT	Right side	Left side
Ventrodorsal	NR	NR

(fig.52)

STERNOCLAVICULAR JOINT	Right side	Left side
Springing distraction	NR	NR

(fig.53)

Antropomotoric measurements:

	RIGHT upper extremity	LEFT upper extremity
Circumference upper arm	33cm	31cm
Circumference forearm	26cm	26cm

(fig.54)

3.7 Evaluation of the Effects of Therapy

The aim of my therapy was mainly to prevent further protective mechanisms, decrease the pain, prevent further restriction of R.O.M and muscles and to educate my patient is correct posture and working positions. The progress we have had I feel has been appropriate to the time spent and the stage of her diagnosis. I would recommend for my patient further therapy, as she will need more help in correcting her posture and stability, as well as to improve her R.O.M further.

I would have hoped to have more progress in her understanding of the importance of her posture in this diagnosis. She does not seem to understand how faulty her posture is, and the importance of improving this to prevent further complications. She is more focused on losing weight when exercising then improving functions as stability and muscle balance.

For the time being working with the hypertone and pain would be my priority. During this time spent with the patient I could also have used PNF relaxation techniques to scapular muscles.

For further work I would continue this therapy regime until the stiffness starts to release. After this a gradual increase in exercises to improve her faulty movement patterns and posture. Also further work with hypotoned muscles would be appropriate. PNF strengthening techniques could also be included in her further therapy, when in stage 3 of her diagnosis.

In addition to the therapy performed during this period of time I could also have combined this with electrotherapy procedures as ultrasound (pulsed), diadynamic currents, diathermia and galvanic currents. My patient has already experienced magnethotherapy and did not have a good experience with this, so she was skeptic to all similar procedures.

Tables of the changes during therapy.

Postural changes:

08.02.10	**17.02.10**
Left shoulder higher then right shoulder, severely.	Still higher, but not to the same extent
M. Upper Trapezius very prominent bilaterally, worse on left side.	Only abnormally prominent on left side, and this also less then previously.
Trunk shift to left side	Shift is still present, but patient is aware and actively tries to change the pattern.
Right shoulder more anteriorly, and shoulders are rotated to the left side	Rotation is still present, but patient is aware and actively tries to change the pattern.

(fig.55)

Palpation changes:

08.02.10	**17.02.10**
Swelling around area of acromion and clavicle, left side.	No swelling present.
Soft tissue restrictions are palpated in upper back over areas of scapula.	No restrictions present in either areas.
Upper Trapezius showed hypertone, triggerpoints, and pain bilaterally.	Hypertone only present in the left side, no triggerpoints or pain present.
Levator scapula showed pain at palpation	No pain present
Deltoid painful by palpation, left side	No pain present
Triceps Brachii painful by palpation, left side	No pain present
Sternocleidomastoid painful by palpation, bilaterally	No pain present
Scalene painful by palpation, bilaterally	No pain present
Subscapularis showed triggerpoints bilaterally and pain by palpation bilaterally.	No pain or triggerpoints present right side, no triggerpoints left side, but still painful by palpation.

(fig.56)

Movement patterns:

08.02.10	**17.02.10**
ABD pattern - faulty	Pattern is still faulty but patient is aware and actively tries to change it.
Push-up - faulty	Pattern is still faulty but patient is aware and actively tries to change it.

(fig.57)

R.O.M changes:

08.02.10	**17.02.10**
Left shoulder flexion, passive: 80 degrees	Now 90 degrees
Left shoulder extension, passive: 5 degrees	Now 15 degrees
Left shoulder extension, active: 5 degrees	Now 15 degrees
Left shoulder E.R; 0 degrees, painful at starting position.	No pain at starting position, but still 0 degrees

(fig.58)

Other changes:

08.02.10	**17.02.10**
Head lateral flexion left: 20 degrees	Now 35 degrees
Head lateral flexion right: 25 degrees	Now 35 degrees

(fig.59)

4. Conclusion

During my time at CLPA I have learned a lot, both regarding the specific diagnosis and also in how to work close to and communicate with patients. I feel that my only worry during this time was the short time available with my patient. Her diagnosis is of a long recovery time, and only 8 sessions felt a bit short to try to achieve any big results. There are also several things I would have liked to include in both my therapy and examinations that I did not have time to do. Especially I would have liked to look deeper into her deep stabilization, regarding breathing and proprioception. Also an examination of cervical spine would have been suitable for this patient. Due to the finding of forward head position there might be problems in this area as well, and for a complete picture of this patient I would have liked to look deeper into this as well.

I found it a bit difficult, during this time with my patient, to make her understand the impact her working position and posture has on her whole body, and how it can give her problems in the future. She does not fully understand or believe in this, and that made it difficult for me to help her further in prevention of any problems in the future. I feel that the cooperation with the patient was overall good, but to some extent I felt that she disagreed with me, and this making some of my conversations with her, and attempts to help her useless.

It has been a nice experience to work with this type of diagnosis, as it requires a large amount of modifications and changes of the typical examination and therapy procedures, due to her stiffness and pain. My patient was also a good picture of this diagnosis, providing me with excellent practical experience associated with my theoretical studies on the subject.

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Supplement:

Figures:

Captions:

Pic.1: Shoulder girdle anatomy, retrieved from *Clinically Oriented Anatomy*, 2006, K.L. Moore, A.F. Dalley.

Pic.2: Reffered pain in shoulder joint, retrieved from *Examination of the shoulder, the complete guide,* 2006, E.G. McFarland, T.K. Kim.

Abbreviations:

E.R: External rotation
I.R: Internal rotation
ABD: Abduction
R.O.M: Range of Motion
CLPA:
P.I.R: post-isometric relaxation, according Lewit
ADL: Activities of Daily Living
TH1:Thoracic Vertebra nr 1